INDEX TO ADVERTISERS AND CONTENTS PAGES 72 AND 74.

THE FOUNDRY

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Practical articles pertaining to the trade in all its branches are solicited and will be paid for.

We can begin subscriptions with the current number only.

Entered as second-class matter at the Post-Office at Cleveland, Ohio.

The Banner Issue of the Foundry.

With this we have the pleasure of handing our readers throughout the world the largest issue of THE FOUNDRY ever printed. It is not necessary to call attention here to the policy which has placed this journal in the front rank among trade papers. We have aimed to give both subscribers and advertisers their money's worth. The subscriber we hold is entitled to interesting and instructive reading matter relating to the trade; the advertiser is entitled to circulation.

In this connection we will state that there is not a foundry known to us, throughout the English-speaking world, no matter how small it is, that is not mailed a copy of THE FOUNDRY at least once a year. This includes besides the shops in our own country the foundries of Canada, Great Britain and Australia. In addition the leading works throughout the continent of Europe receive THE FOUNDRY regularly, so that we may truthfully claim to cover the foundry trade of the earth.

We have always insisted that the advertiser has no claims on our reading columns for space and that the place for him to tell his story is in that part of the paper set apart for him. The subscriber has a right to demand that the reading columns of the paper he pays for shall be filled with something more substantial than personal puffs and parts from catalogues. It has at times been difficult for us to make an advertiser realize that we could not describe his personal affairs in our editorial columns without injuring him as well as the paper. The uniform support received from the trade shows that our position in this matter is approved.

There is no part of modern foundry equipment which may not be found in the advertising columns of THE FOUNDRY, and we believe our readers will agree with us that to the man who wants to keep posted these are of equal value with the reading columns. This issue contains an unusual display of things which help to make a foundry successful and to these we direct the reader's attention. The man who has sufficient faith in his product to spend money in advertising it is generally a pleasant and business-like individual to deal with

Trade Outlook.

As long as foundries continue to find it difficult to procure iron and coke in sufficient quantities, when every furnace is being driven to the utmost to supply its share of iron and fails to satisfy the needs of customers, there can be no reason to complain of the volume of business with which shops are favored. Many foundries having contracted for a supply of iron months ago now find that they have either underestimated their needs or that their orders can not be filled on time, which but serves to intensify the already strained conditions of the market and has resulted in shoving prices of iron several points upward.

The permanency of present conditions or at least a belief that this country will continue to consume iron and steel products on an increased scale is showing itself in projects for new blast furnaces, no less than twenty-seven of these being under construction or definite plans prepared for same, which will increase the annual capacity fully 2,500,000 tons. Of

these each of the leading cities in the lower lake region secures its share, it having been decided to build furnaces at Buffalo, Cleveland, Toledo and Delray, one of the suburbs of Detroit, all of which will produce foundry iron. No special advantages have hitherto been assigned the two last named points for industries of this kind but it is claimed that the foundries in this territory have more than enough consuming capacity to take care of all the iron which will be made and that the protection afforded by freight charges from other points will more than counterbalance any small increase in cost of production. In this connection is to be noted the furnaces under way at South Chicago and the recent completion of a furnace at Milwaukee, which will increase the supply of foundry iron in Western centers. Thus the territory adjacent to the lake region, the greatest consuming center of foundry iron in the world, may be said to have been tolerably well taken care of, as far as the future is concerned. Added to this are the constant improvements being made by existing plants which in the aggregate tend to materially increase the output of iron.

As matter of universal interest to foundrymen we reproduce the following paragraphs from market reviews issued by Rogers, Brown & Co. through their offices as noted:

Cincinnati: A heavy demand for engines and other high grade castings has caused foundrymen to take a decided interest again in charcoal iron. A few years ago it was supposed that the prestige of iron made with charcoal as fuel was rapidly passing away, but it seems to be regaining favor and there is a great scarcity of it. The Lake Superior charcoal furnaces are so far sold ahead that it is almost impossible to place any orders for early delivery, and the old furnaces in the Hanging Rock district are now being turned to for a supply. Their output is so limited that very little relief can be expected from that direction, and they have advanced prices from $28.00 to $30.00 per ton f. o. b. furnaces.

The principal Southern charcoal furnaces are sold ahead for the entire year. It will probably be necessary for foundries to use Bessemer or low phosphorus coke brands as a substitute for charcoal; but these are also hard to find.

There has been a fair run of orders and a number of inquiries for delivery well into 1903. There is no let up in the rate of consumption, but on the contrary large concerns state that they are melting more than they expected and are trying to get deliveries on existing contracts anticipated.

Should the anthracite miners strike there will be an iron famine in the East, for the furnaces there are carrying practically no stocks and the yards of consumers are mostly bare.

It is thought by some that the furnace workers in the West are realizing that it will be impracticable for the furnaces to put on three shifts of eight hours each, and that they will not make such a demand on June 1. It will be very unfortunate if they do strike, for the furnaces will undoubtedly all be obliged to bank for an indefinite period, and it will cause a general shutting down of foundries and mills who depend on Ohio and Pennsylvania iron.

The question of how many pounds shall constitute a ton of Southern iron is apparently unsettled. One of the leaders in the Southern combination states that it will ship on new contracts 2,240 pounds, while the agent of another company of equal importance in the market says that his company will continue to ship 2,268 pounds.

The point has been reached where it is almost impossible to find any kind of iron for early delivery. Evidence is coming forward daily, that the urgent demand for spot iron is largely from concerns who supposed they had insured a supply, but who have found that the companies selling them overestimated their ability and cannot make the deliveries agreed upon. A striking instance of this is reported from a prominent Indiana town where it is stated that three of the four stove foundries located there are shut down for lack of iron. All of them have contracts at prices ranging from $10.50 to $12.00 with three of the largest producers in the Southern combination, but the iron due them cannot be obtained and the foundries prefer to shut down rather than to pay present prices. If this plan were to be followed out by all consumers who cannot get iron on their low-priced orders, the situation would be somewhat relieved by the falling off of consumption. Parties having their order books well filled for castings at profitable prices naturally do not care to regulate the market by this method, and most of them are trying to keep in operation by new purchases. This is largely the cause of present prices, for if the furnaces were able to supply what they have sold, the market would be in much easier condition.

Some of those who have been induced to withhold buying on account of the assurance that there would be plenty of $12.00 iron later in the year, have come into the market and covered their wants, not daring to wait longer. They are in an unpleasant frame of mind, because they say they would have bought earlier at lower prices had they not been induced to defer by the promises made them.

There is a heavy demand for Bessemer iron, and fancy figures could be secured if anyone had it to sell.

Chicago: By far the larger transactions have been for Northern brands. The selling policies of Southern furnaces are not fully defined and, although the furnace managers have laid their plans carefully, their selling agents do not seem to be able to assist the uneasy buyer to reach a definite conclusion. Some large inquiries are now up for consideration, involving both Northern and Southern brands. More frequent inquiries are coming from malleable foundries, which is an indication that there are further large orders to be placed. The situation seems to be entirely free from excitement and purchases being made are evidently the result of careful consideration on the part of buyers. A casual survey of the sources of supply in this district should easily convince the most skeptical consumer that, if the present rate of consumption continues, there will not be enough pig iron to go round. The uncertain quantities, of course, are labor troubles at about this time of the year or some sudden financial scare, either of which would tend to check consumption. Indications of the approach of the former are apparent, as demands for higher wages are being made in various quarters and complaints are numerous and frequent that sufficient skilled labor cannot be secured; financial trouble appears to be a remote possibility.

The coke situation is fairly easy, although strikes in some quarters have been causing loss and inconvenience. The main supply for this territory is now being drawn from the Virginia and West Virginia fields. Connellsville operators apparently have all they can do in the endeavor to fill contracts on which deliveries are past due.

Notwithstanding frequent assertions that the South will have plenty of iron to sell for the last half of the year, it is confidently claimed by many who ought to know that order books of Southern furnaces are very full and the majority of them have all they can do to supply during the remainder of the year what they have already contracted to deliver. The new furnaces going in from time to time seem to be counterbalanced by those going out for repairs. Iron is being melted at a terrific rate all over the country and it is a well established fact that production is not being increased to an equal extent.

New York: Any severe labor contest that would curtail the supply of raw materials at this time would have a damaging effect upon the whole fabric of national prosperity. It is so much to be deplored from the standpoint of both the employer and employed that the public assumes that neither side will permit controversies to go too far. This assumes wise leadership on both sides which, unfortunately, does not always show itself.

We pointed out some weeks ago that the relief from excess demand must be found for the present in importations. These have been going on steadily in various forms. While the movement is not sensational, it is of steadily increasing volume. The tonnage, however, runs to steel billets, bars and structural material more than to pig iron.

Buffalo: Furnaces are doing their utmost to take care of their customers' wants and supply the required iron on existing contracts, but foundries everywhere continue to call for their iron at the maximum rate allowed by their orders and the resulting shortage calls for a great deal of patience on the part of both consumers and producers. The difficulties which furnaces have experienced in obtaining their raw materials have made it a physical impossibility to meet all the demands made upon them.

Occasionally a special lot of iron is offered for early delivery and is quickly absorbed. A noticeable fact, is that a great many buyers who had apparently covered for their season's requirements are sharply on the lookout and quickly snap up offerings of odd carloads.

Philadelphia: Ordinarily two or three shiploads of foreign metal coming into this port might make a change in the price of local brands, but local furnaces seem pleased that their customers are able to seek temporary relief by applying to their neighbors across the water.

Never in the history of this country has any buying movement set in that equals the present one. With the incoming tide, ships from abroad drop anchor in the Delaware and discharge cargoes of billets and pig iron. Lighters and floats are taxed to their utmost

capacity to handle this metal and a visit to the works of parties who are to use the goods shows light stocks of raw material on hand with overfilled order books for finished material. A few days ago fourteen furnaces, twelve active, showed total stock on hand of about 1,500 tons with orders to execute amounting to over 140,000 tons. These conditions are no doubt general and apply to all iron producing districts.

Cost-Keeping in Foundries.

It is about seven years since the subject of "Shop Costs" began to be discussed at meetings of foundrymen and in looking over the records of that time it is curious to note that one jobbing founder, who had a "system" which told him at a glance what it cost him to turn out each lot of castings, failed in business a few months after describing the benefits of same. This does not prove that cost systems are not valuable but it does tend to show that the keeping of such will not prevent failure. In this case the timekeeper had charge of affairs and when all details are analyzed it will more than likely be found that the system its owner considered so valuable did really not amount to much after all.

Most foundrymen seem to have an idea that the principal object in supporting a cost system is to learn the cost per pound of castings, some shops going so far as to simply strike an average of all classes of castings made during the year,' which is but little better than the information obtainable through stock-taking. While it is true that it is possible to overload any system with red tape to such an extent as to make the cost of maintaining the same greater than the returns to be obtained therefrom, yet a cost system must have more or less details connected therewith to accomplish the greatest good. In a general way it is our opinion, however, that in keeping foundry costs no attention has been paid to features, which in themselves could be made a record of where improvement is most needed.

The fact of the matter seems to be that most cost systems, as seen in our foundries, are laid out with the idea of obtaining simply the value of so much material and the labor expended upon same in transforming it into a finished casting. We have seen systems, yards long, which showed with what nicety divisions and sub-divisions could be made and charges to different departments split to the thousandth part of a cent, yet not one of these gave the least indication as to where time was being lost.

The majority of foundrymen, when the cost keeping fever strikes them, proceed to hunt around for examples of what their neighbors are doing instead of studying out the needs and requirements of their own establishments. There is nothing like self-help on such occasions. Let us assume that the first step will be to ascertain the way in which the workmen spend their time. Ten chances to one the molder will be handed a daily report card which he is to fill out so that it will show where his ten hours have gone. At the end of the day it will be found to read something like this: Hanger casting, 2 hours; piston head, 3 hours; drill frame, 5 hours; total 10 hours. Now does this show the way the molder has actually spent his time? The chances are it does not.

If the molder spent half an hour on the first casting looking up a flask for same or for various reasons did no molding in this length of time why should this item be included in a general statement of the time elapsed before the mold was finished? Let us say that the core for the piston does not fit as it should and that the molder is compelled to put half an hour's work on it, rubbing or filing it into shape, is it right that he should go on record as having consumed three hours' time in molding this job? Again, suppose that he loses another half hour on the last job, just because some other molder has a cope, he can not get out of the way, hanging on the crane and that he spends an hour and a half helping out with the heat, why should the drill frame casting be charged with five hours of molding when only three hours were actually thus expended? The proper way to distribute the molder's time for the day, it seems to us, would be about as follows: (1) Finding flask, ½ hour; (2) molding hanger casting, 1½ hours; (3) molding piston head, 2½ hours; (4) fitting core for same, ½ hour; (5) molding drill frame, 3 hours; (6) waiting for crane, ½ hour; (7) casting, 1½ hours. Total, 10 hours.

Items 1, 4 and 6 show at a glance that the molder has spent part of his time doing something it should not be necessary for him to do. The time spent in casting should be distributed over the total number of castings made during the day or else entered as a separate item. It is not necessary that the molder should be required to split seconds or minutes in recording what he has accomplished through his working hours, but in order that a cost

system shall be worth anything it is absolutely necessary that he should tell as near as possible how his time has been spent. While it is true that all of this has to be charged against his output, a detailed statement will indicate where time is being wasted.

Cost systems have been designed by men having three or four letters hitched onto the caboose of their name, and they have all neglected, as far as the foundry is concerned, to secure the intelligent co-operation of the employes in that department. The foreman himself must be an active supporter of any system it is intended to have of real value. It is not enough to have a youth from the timekeeper's office collect evidence once a day on a tabulated sheet. Let the workmen make out their own time cards under the supervision of the foundry foreman, and let the latter insist that they shall be filled out correctly and the best features of a cost system will be preserved.

It is Easy to Show Figures.

Touching upon the possibility of reducing the cost of iron mixtures through the use of scrap, a contributor to a contemporary illustrates how twenty per cent of scrap at $12 per ton, against $20 per ton for pig iron, would net a firm, making thirty-five tons of castings a day, about $15,000 in gold during the year. Then we are informed by the same authority that the only reason why foundries in general are not in the habit of picking up this easy money is because they don't pay their foremen at least $2,000 a year. It is also hinted that proprietors of foundries are unconscious of the fact that they are losing all of this coin from year to year, and with this opinion we thoroughly agree, and furthermore believe they never will learn such is the case.

It is one of the easiest things in the world to show examples of "foundry management," which are a hundred years ahead of the times, if one may be allowed to give his imagination free rein and be permitted to juggle with figures which have no existence in fact. Too many of the articles written in the interest of the supposedly neglected foundry trade are based on very flimsy theories and rest on nothing but air. One of the first things which should be done by the proposed Founders Trade School is the establishment of a department for the scientific treatment of the incurables who cannot help but tell how many thousand dollars they can save a foundry from month to month if they were in control. The wonderful stunts of foundry practice they perform begin and end on paper. When you nail them down to actual shop records they close up like clams.

For fear that the majority of foundries will make a stampede for the camping grounds of the $2,000 and upwards a year foremen, who are capable of turning many thousand dollars annually into the pockets of their employers, through melting scrap, we will call attention to the fact that cast iron scrap is not very much of a drag on the market these days and the supply is not likely to show any material increase unless some of the foundries should make a specialty of turning out scrap for the market. The following figures from the leading iron markets will show the relative value of No. 2 foundry iron and machinery scrap:

	No. 2 Foundry Gross Ton.	Machinery Scrap Net Ton.
Chicago	$18.65-$19.15	$14.25-$14.75
Philadelphia	$19.75-$20.50	$16.75-$17.50
Cincinnati	$17.75-$18.25	$14.00-
Cleveland	$19.25-$20.25	$15.50-$16.50
Pittsburg	$20.50-$21.00	$17.50-$17.75

It will be noted that the prices quoted for No. 2 foundry iron apply to gross tons while the scrap iron is net. If both are figured up on the same basis the prices given will show considerable less variance. Then it is to be remembered that it costs more to handle the average grade of cast scrap than pig iron, which brings the value of the two yet closer. Admitting that many foundries could use more scrap in their mixtures, especially with the aid of high silicon iron, which in turn comes at a higher figure than ordinary foundry iron, it is also a dead certainty that the real economy of melting scrap is far below the estimate furnished at the beginning of this article. We would remind the author of this statement that the leading foundries throughout the country are not managed by greenhorns by any means but by men who know enough to utilize all the scrap they can lay their hands on, at reasonable figures, in such castings where the same may be used to advantage. It is not as yet accepted as a law that the foundry which melts the most scrap makes the most money. If such were the case cast iron scrap would command a higher figure than it does.

The Johnson City Foundry & Machine Co., Johnson City, Tenn., is incorporated with a capital of $25,000.

The Landis Tool Co., Waynesboro, Pa., has increased its capital stock to $150,000.

Take a Day.

It is a well-known fact that all classes of people need recreation in one form or another. All work and no play does not help to make bright workmen, neither is it a good policy to keep those having charge of foundries cooped up too closely at home.

It is a good policy for you to come in contact with your competitors occasionally, to learn that they are human like yourself and that when you really know them they are not half as bad as you had imagined.

It is a mighty fine thing for one to find out for himself that there are others who know something about the foundry business; once in awhile you learn that they can make castings for less money than you can. It may hurt your pride to learn that such is the case but it is better that you should know it.

The American Foundrymen's Association will hold its seventh annual convention in Boston, Mass., June 17-18-19. Of course you know you ought to be there; good time of the year to rest for a day or so. Bring along your foreman or superintendent; you have been very, very busy, maybe you are pretty well tied up even now, but then you can spare him a day or two, shop affairs can be so arranged as to take care of themselves for forty-eight hours.

If your foreman has worked hard, has made money for you, why not hand him a few dollars of the profits and tell him to go down to Boston for a couple of days and meet a few of his own kind? This is a good way of showing your appreciation.

The Hotel Brunswick has been selected as the Boston headquarters, the rates are $4.00 per day on the American plan for rooms occupied by one person, two persons $7.00 per day. Secretary F. F. Stockwell of the New England Founders' Entertainment Association announces that the Hotel Brunswick will probably be able to take care of all the visitors wishing to stop there, but in case of insufficient capacity, the Hotel Vendome, near by, under the same management, and with the same rates, will be available. It is distinctly understood that the Hotel Brunswick will be all on the American plan with this convention. Those who desire the European plan will find a number of other hotels in the vicinity.

Directly across the way from the hotel headquarters is the Massachusetts Institute of Technology, the Assembly Hall of which has been placed at the disposal of the American Foundrymen's Association through the courtesy of the University authorities. It is here that the meetings will be held and the convenience of this arrangement will add interest to the occasion.

Reduced rates have been granted by the railroads, on the certificate plan, of a fare and one-third for the round trip. In order to take advantage of this it is necessary that you obtain a certificate at the time you purchase your ticket. When registering at convention headquarters hand this to the secretary so that it may be countersigned by the proper officials and returned to you when you can secure your return ticket for one-third of the regular fare. All of these certificates must be in the hands of the secretary not later than noon, June 18. Tickets may be purchased as early as the 13th and are good for return passage up to and including June 23.

An extensive programme has been mapped out by the secretary of the American Foundrymen's Association, Richard Moldenke; this includes a number of highly interesting papers which are of such a practical nature that every foundryman may take part in the discussion of same. Among these are a paper by S. H. Stupakoff on "Jigs." The author has devoted much study to the question of molding machines and the economy which follows the introduction of special patterns, one of his papers upon this subject appearing in the May issue of THE FOUNDRY. Mr. Stupakoff will also read a paper dealing with "Flasks," at the Boston meeting.

Paul R. Ramp, lately appointed superintendent of the American Locomotive Company's foundry at Schenectady, N. Y., will read a paper on "Economy in the Foundry." Hugh McPhee, of the Eaton, Cole & Burnham Co., Bridgeport, Conn., will take up the subject of "Shop Conditions." "The Metallurgy of the Cupola" is the theme chosen by Herbert E. Field. R. C. Cunningham, who is at the head of the foundry department of the Deane Works of the International Steam Pump Co., Holyoke, Mass., will have a paper on "Foundry Costs," a subject in which nearly every maker of castings is manifesting some interest at this time, especially so if he is bidding for work in the open market and is compelled to meet competition in various forms.

"The Effect of Melting Steel with Iron in the Cupola," ought to prove a very attractive subject for general discussion. It will be presented by H. E. Diller and as many of the foundrymen who will attend the meeting have

had a great deal of experience with semi-steel mixtures, some interesting details connected therewith will undoubtedly be brought out. For the benefit of those who are only engaged in the melting of the more expensive metals and alloys Charles Vickers will provide a paper dealing with "Brass Melting." The extent to which the production of castings is facilitated through proper shop appliances will be taken up by Jas. A. Murphy, of the Ball Engine Co., Erie, Pa., in a paper entitled "Shop Rigs and Tools." Edward B. Gilmour, of Milwaukee, who has had a very extended schooling as workman and manager in the heavier class of castings will read a paper on "Cores and Core Arbors."

"Some Methods to Increase Foundry Production" is the significant title of a paper which will be presented by David Reid, of the Saco & Pettee Machine Shops, Biddeford, Me. As Mr. Reid has brought the foundry with which he is connected to a very high state of perfection in a relatively short time and has introduced many original ideas into the operation of this plant his remarks on the above theme will command close attention. Percy Longmuir, the well known English writer, will contribute a paper on "Cast Iron." John G. Stewart, whose experience has been largely with the commercial side of British foundries, promises a paper on "Foundry Shop Costs." It is also expected that E. H. Putnam, superintendent of the Moline Plow Co., Moline, Ill., will present a paper dealing with "General Foundry Practice." There will also be a lecture delivered by Albert Sauveur, manager of the Boston Testing Laboratories, on the "Application of Metallography to Foundry Work."

After the reports of the officers of the Association have been disposed of the committees which were appointed a year ago will report on the following subjects: "Standard Sampling of Pig Iron," "Standard Methods of Determining the Constituents of Cast Iron," "Foundry Trade Schools," "Grading Pig Iron by Analysis," "Standardizing Bureau." Memorials will also be presented to the convention dealing with the "Insurance of Patterns" and the "Valuation of Pig Iron for Foundry Purposes."

Taking it altogether this is by far the most complete programme ever outlined for the instruction and entertainment of those who attend the annual meeting of the American Foundrymen's Association and those who go to Boston this year will not find time hanging heavy on their hands. Besides this the foundrymen of Boston and vicinity have got something under way in the form of entertainment features which they refuse to divulge but they say: Come to Boston June 17-18-19 and you will not be disappointed with the hospitality for which New England is so famous.

Gas Furnaces for Brass Foundries.

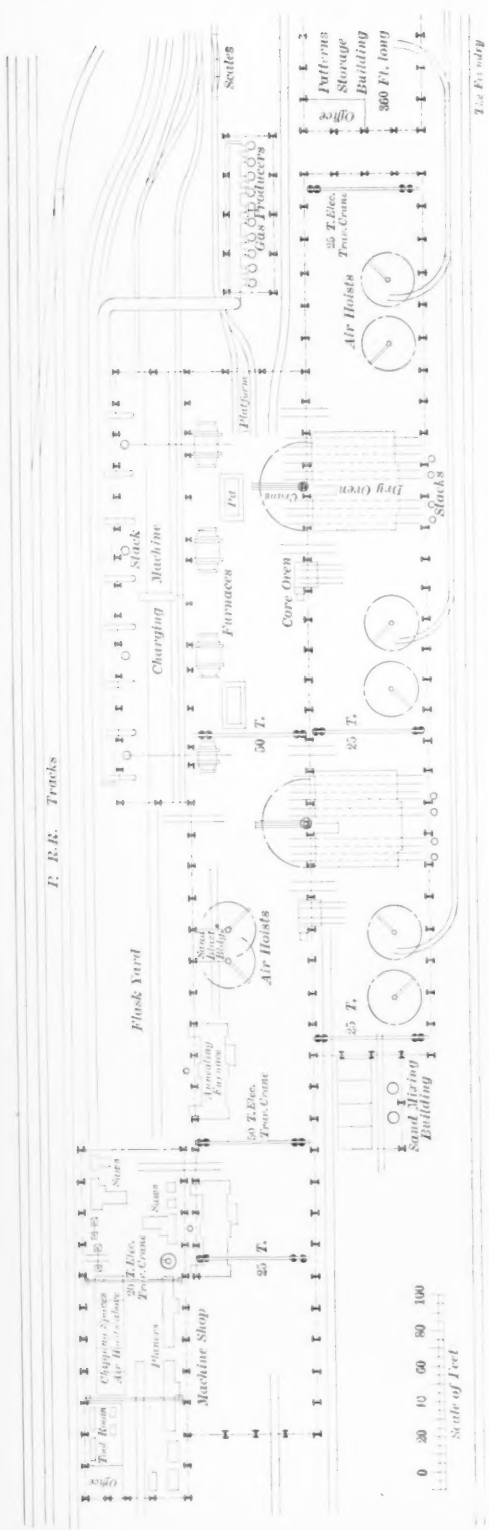
I have been rather surprised to find that some of your brass founders have not been successful in using gas furnaces for melting brass as we have had some in use here for several years and find them much more satisfactory than the old coke furnaces which we discarded. We secure greater speed in melting and more uniform heats throughout since we began melting with gas, which is made by a Wilson Producer. We do not employ a forced draft.

When we first started to utilize gas as a fuel we found that the life of our crucibles was shortened to some extent, but in our endeavors to find a reason for this we learned that the furnace tender was in the habit of leaving the hot crucibles after being emptied, outside in contact with the cold air and believing that this in a measure had something to do with their giving out sooner than they should, we put in an additional row of crucible holes along the center of the furnace for the exclusive use of crucibles not in active service. This keeps them always hot and has resulted in giving them a longer life and we find that they are now lasting equally as long as when we employed coke furnaces. WM. PURSLOW.

Wolverton, England.

The Messinger Mfg. Co., Tatamy, Pa., will build a foundry 80x160 feet.

A combination of several large steel foundries is under way, the concerns mentioned in connection therewith being the American Steel Casting Co., with plants at Chester, Pa., Sharon, Pa. and Alliance, O.; the American Steel Foundry Co., Granite City, Ill.; the Sargent Co., Chicago; Benjamin Atha & Co., Newark, N. J.; Franklin Steel Casting Co., Franklin, Pa., and the Reliance Steel Casting Co., of Pittsburg, Pa. It is proposed to name the new company taking over these plants the American Steel Foundries and to organize with a capital of $40,000,000. The concerns mentioned control about twenty-five per cent of the output of steel castings in the United States.



PLAN OF THE PENNSYLVANIA STEEL CO.'S STEEL FOUNDRY, STEELTON, PA.

The New Steel Foundry of the Pennsylvania Steel Co., Steelton, Pa.

The Pennsylvania Steel Works ranks among the oldest steel industries in eastern Pennsylvania, Bessemer steel having been made there as early as June, 1867. The Steelton works are located on the Susquehanna River, about three and a half miles from Harrisburg, Pa Excellent railroad facilities are provided by both the Pennsylvania Railroad and the Philadelphia and Reading Railway.

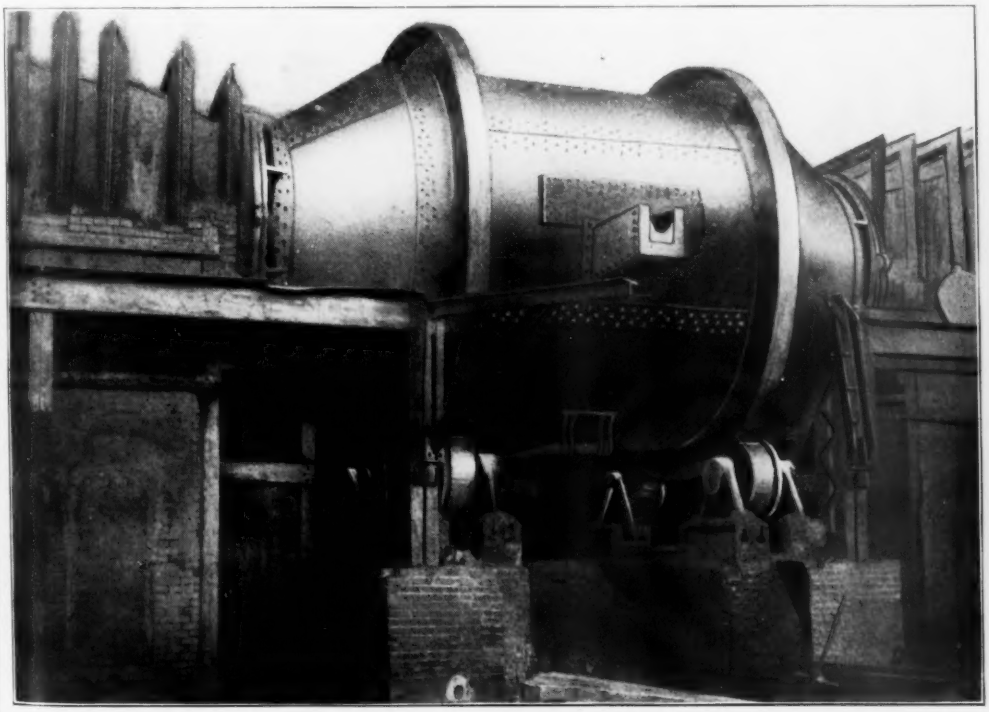
The Pennsylvania Steel Co. operates three foundries, a gray iron foundry for turning out such castings as are required in the company's works, there is also a foundry attached to its frog, switch and signal department and a new steel foundry has recently been completed, and it is to this latter that this article will be devoted. The Pennsylvania Steel Co. have for a long time manufactured steel castings, both for their own use and for outside consumption, and the demand from the latter source has increased to such an extent that they have recently found it necessary to build a complete new steel foundry in order to take care of this trade. With this completed, the Pennsylvania Steel Co. will be more of a factor in the steel casting trade than heretofore.

When completed the new foundry will have a length of 756 feet and a width of 134 feet, together with a lean-to 40 feet wide in the rear of the furnaces. The building is of steel construction throughout, the walls and roof being formed of corrugated iron. In laying out the plant special attention was paid to obtaining as much natural light as possible, and in addition the interior of the roof has been painted white, which tends to increase the amount of light throughout the building. A system of arc lights is provided to thoroughly illuminate the plant when artificial light becomes necessary.

The plant is divided into two bays, each 67 feet wide. In the one where the molding floors proper are located there are three twenty-ton traveling cranes, all provided with a ten-ton auxiliary hoist and having a clear lift of twenty-five feet. In the bay next to the furnaces, which is given over to the assembling of the molds after being dried, and to the molding of specially designed shapes, the annealing furnace, the sand blast apparatus, cold saw cutting off machines, etc., there are two traveling cranes of fifty tons capacity, each provided with twenty-five-ton auxiliary hoists, and one crane of twenty-five tons capacity with a fifteen-ton auxiliary hoist. All of the cranes in this department have a clear lift of forty feet.

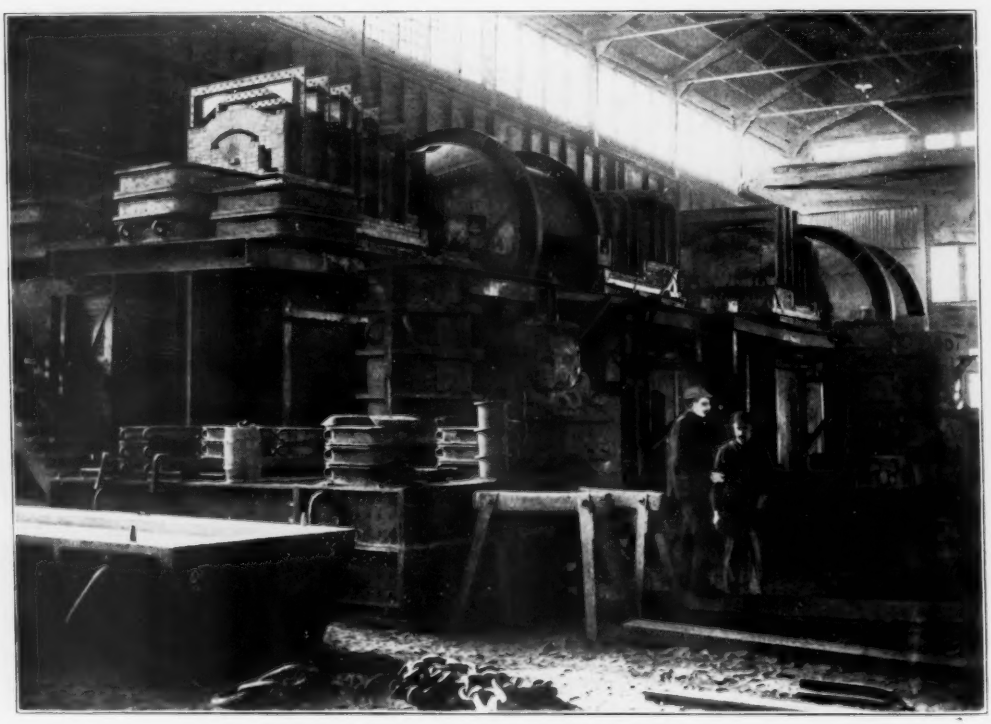
STEEL FOUNDRY OF THE PENNSYLVANIA STEEL CO.

An inclined, narrow-gauge track provides a means for reaching the charging floor of the furnaces. Arrangements have also been made for the casting of ingots, in case these should become desirable. Ample core oven space has been provided and this will be doubled when the shop is finally completed. At the present time, one ten-ton and one twenty-ton open hearth furnace are completed and two more twenty-ton furnaces are contemplated. These are of the Campbell tilting type, designed by H. H. Campbell, general manager of the works. The electric power to operate furnaces, cranes and other shop equipment is obtained from the company's central power plant. From three to four heats can be obtained from each

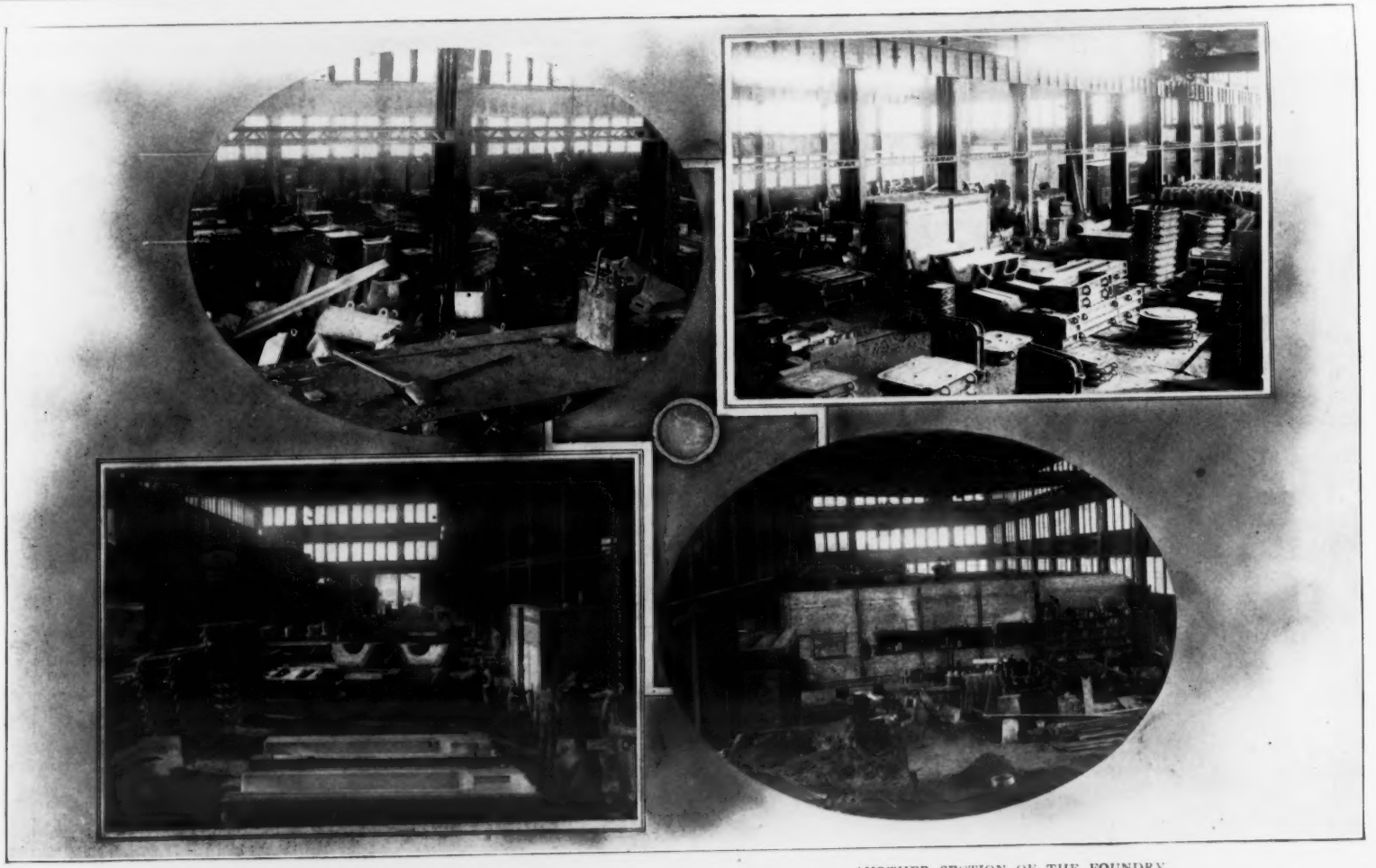


THE CAMPBELL TILTING OPEN-HEARTH FURNACE.

TRACKS AND CARS FOR HANDLING MELTING STOCK. GAS PRODUCER AT THE LEFT.

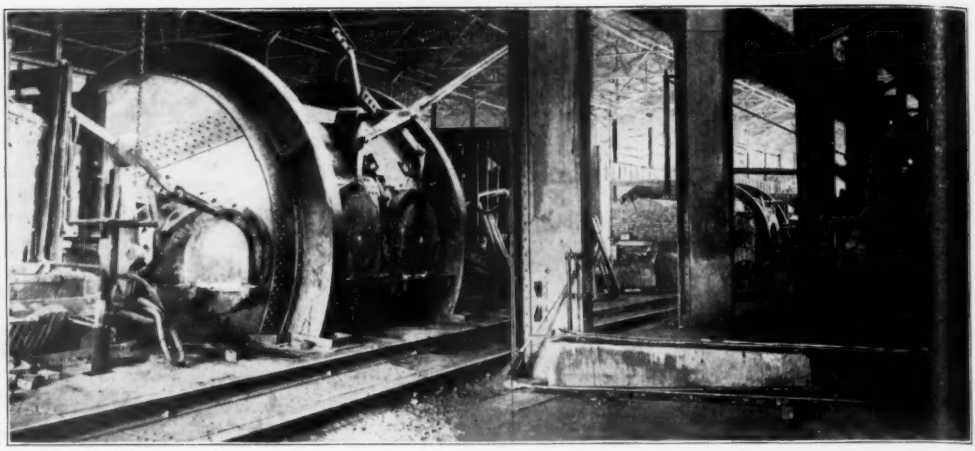


THE FURNACES AND CASTING PIT WITH SPECIAL INGOT MOLDS.



A CORNER OF THE MOLDING FLOOR.
ASSEMBLING FLOOR.

ANOTHER SECTION OF THE FOUNDRY.
CORE OVEN FOR SMALLER CORES.

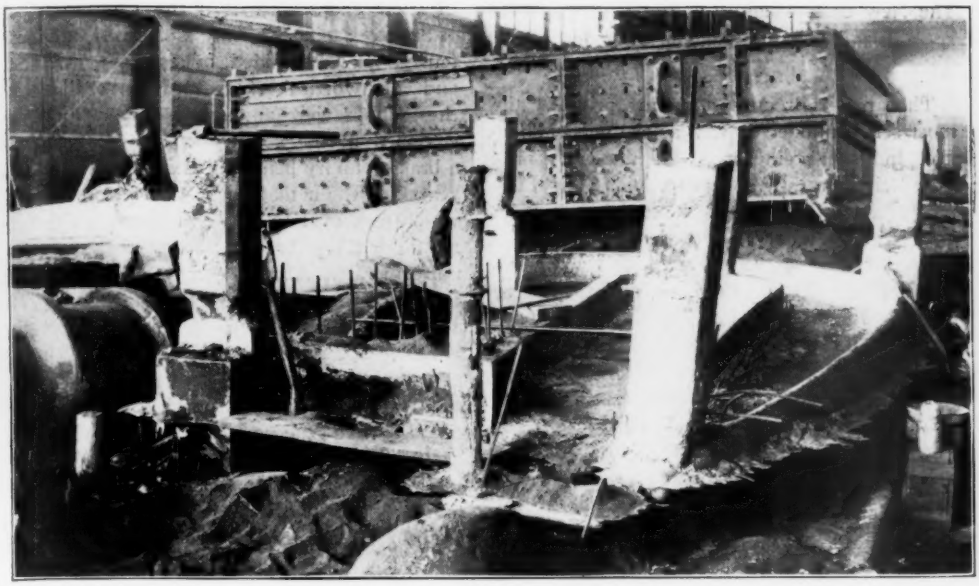


THE FURNACES AND CHARGING PLATFORM.

furnace daily, and it is calculated that when completed their plant will have a capacity of 250 tons per day. A gas producer plant with sufficient capacity to take care of this part of the works has been provided.

The plan of the works shown herewith gives a fair idea of the general arrangement of this foundry. It will be noticed that everything moves continuously toward the shipping department without any retracing. From the

AN EXAMPLE OF SUBSTANTIAL FLASK CONSTRUCTION.



A LARGE STEEL CASTING AS IT LEFT THE MOLD.

(The long and heavy Sink-Heads give an idea of what is necessary to produce solid steel castings.)

molding floor the molds pass through the core ovens and from there to the assembling rooms where they are cast and the flasks and sand returned to the molding floor while the casting proceeds to the cleaning department. Casting pits are provided for handling special ingot castings of as great a length as twenty-seven feet. A fully equipped pattern shop together with fire proof storage vaults are located conveniently to the foundry. The machine shop, which will be 200 feet long by 60 feet wide is nearly completed, and will contain a complete outfit of up-to-date machinery for handling steel castings.

The Foundry Trade School.

To the Editor:

There seems to be a misunderstanding as to my statement "that the specialty manufacturer demands the best of a man as a true and skilled mechanic." This was not intended to apply to workmen but to managers. There are many specialties wherein a manager can utilize knowledge and skill obtained through a general experience in different classes of work. The specialists generally find that if there is trouble with a few castings, the same extends to almost all made in a certain heat, whereas, where there is a variety of work, as in a general shop, one class of castings only may be defective or giving trouble.

In our own business, there is hardly a week passes that some incident does not occur, which draws upon my store of knowledge, and experience, and did I not possess this, great losses would be incurred. We are running close to 100 tons every day, and if, at any one heat something goes wrong, it would prove very expensive if experimenting had to be done, to remedy the trouble, as must be the case with all of those who have only had a limited experience. Not only have I in my own shop experience demonstrated that benefit is to be derived from a general knowledge of founding, even in managing a specialty, but my experience as an expert in correcting difficulties in other specialty shops has demonstrated to me more than all else the wisdom of specialty managers possessing as broad a knowledge of founding as possible.

I do not mean to imply by the above that a specialty shop demands more of a manager than a general or jobbing work shop. However, more knowledge of and experience in general founding can well be utilized in successfully managing specialty shops than is usually conceded. THOS D. WEST.

The Northwood Foundry, Northwood, owa, will soon begin operations.

The Mutual Machine Works have recently been organized at Washington, N. C. Foundry and machine shop are now being built.

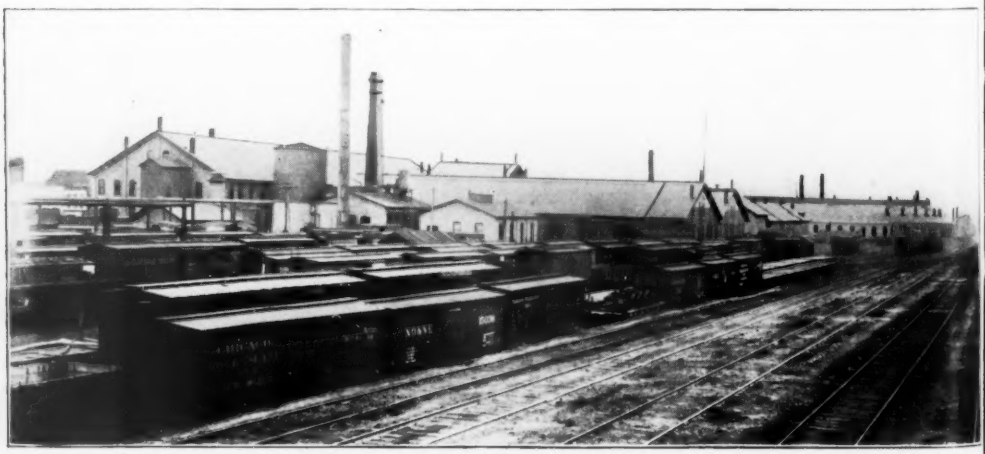
The New Brass Foundry of the Chicago, Rock Island & Pacific Railway Company, Chicago.

The great railroad systems are probably the most self contained as well as the most important industrial enterprises of modern times. The British railways have provided for their independence from local manufacturers to a greater extent than those of the United States. Take, for instance, the London & Northwestern Railway Co., of England, and they have not only facilities for building their own locomotives and cars but have also a complete steel producing plant where they make boiler plate, bridge material, bar iron, steel rails, etc.

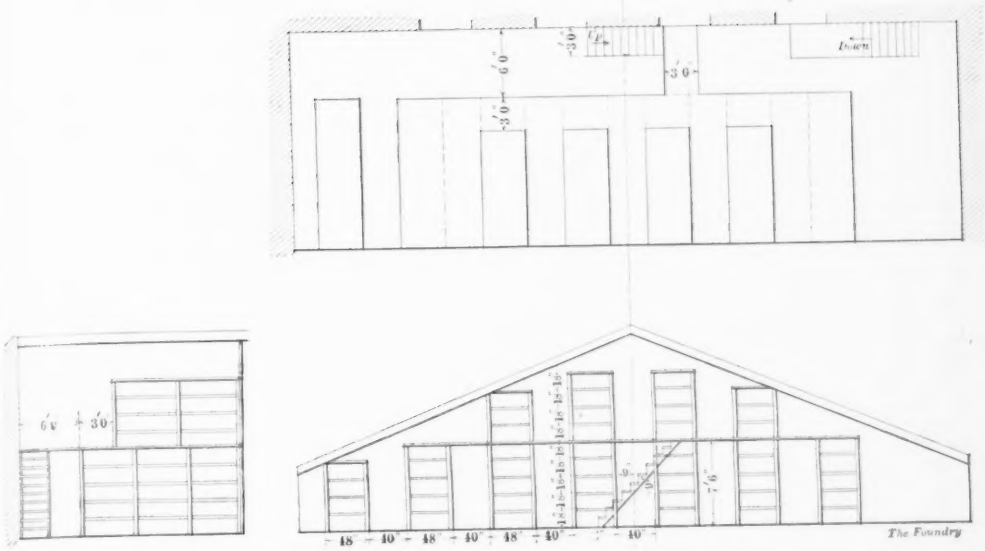
While the railroads of the United States have not as yet advanced as far as this, instances are not lacking where transportation companies have become chief stockholders of many large manufacturing enterprises. The facilities possessed by the railroads of this country for manufacturing locomotives and cars and making the necessary repairs to their enormous rolling stock forms a respectable portion of our industries and is very interesting in its diversified complexity. All over our land are scattered what are commonly termed "railroad towns," a designation which scarcely causes any comment although a railroad town, like Altoona, Pa., has over 50,000 inhabitants.

A great many molders are acquainted with the class of castings known as railroad work, having come in contact with same either in railroad shops or in foundries doing work under contract. Relatively but few railroads have iron foundries of their own, but most roads have brass foundries attached to some of their shops. In 1868 the Chicago, Rock Island & Pacific Railway Co. erected the extensive plant bounded by 47th St., 53d St., and Wentworth Ave. in Chicago. At that time these shops were among the largest and best equipped in the country, an iron as well as a brass foundry being part of the plant. Some years ago the management of the iron foundry was turned over to a stock concern which furnished castings to the railway company at a uniform rate. About a year ago both of these foundries were torn down to provide room for a new roundhouse and this necessitated the building of a new brass foundry, to which this article will be confined. Through the courtesy of Mr. G. F. Wilson, Superintendent of Motive Power of the popular "Great Rock Island Route" we are enabled to show the attached illustrations which we are sure will be of general interest to our readers at large.

Mr. Joseph Shirley, who for many years successfully conducted the company's brass foundry, received a commission to thoroughly investigate modern brass shops, methods and appliances, in Chicago and other cities, and guided by his findings the new foundry has been arranged as shown in our illustrations. It is 82 feet long by 60 feet wide, though part of this floor space is occupied by boring machines for car brasses, emery wheels, rattlers and a babbitting and lead lining furnace. A battery of ten brass melting furnaces was designed and patterns made, but while in progress of construction the Hawley Down Draft Furnace Co., of Chicago, builders of the Schwartz furnace, made a very liberal offer to the company to install their furnace for an exhaustive trial without cost to the railway com-



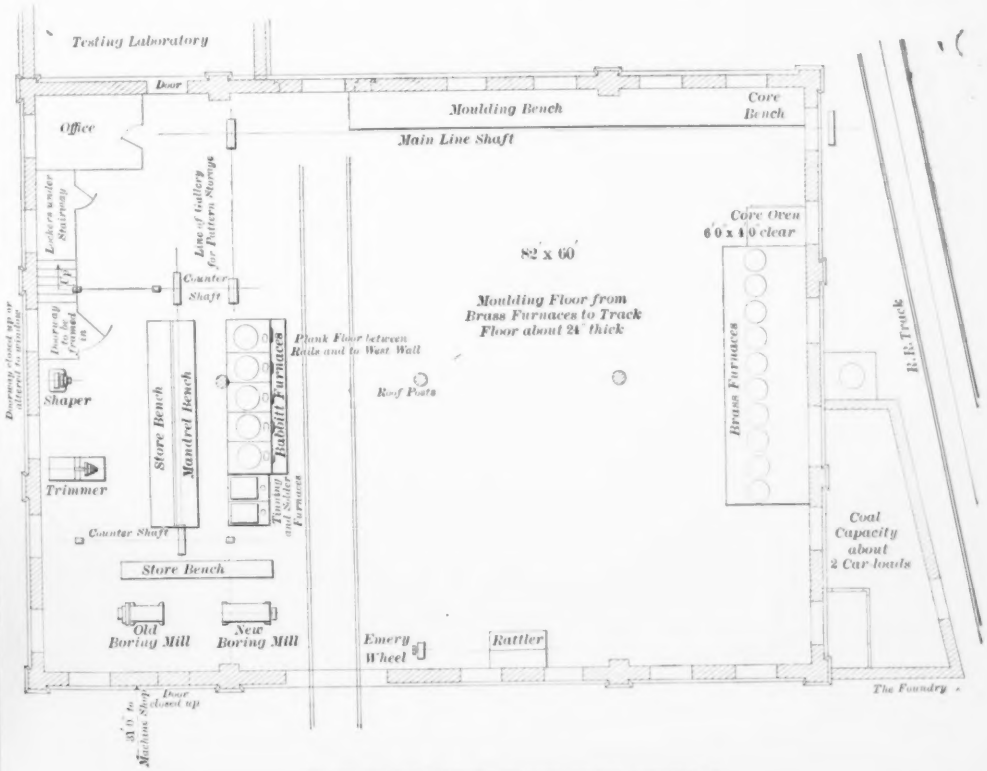
GENERAL VIEW OF THE ROCK ISLAND RAILWAY SHOPS, CHICAGO.



PLAN AND ELEVATION OF PATTERN STORAGE ROOM.

pany, so only four of the original furnaces have been completed.

It will be noticed that the furnaces for the crucibles are formed of two cast iron cylinders one within the other, and leaving an air space between them. The inner cylinder is

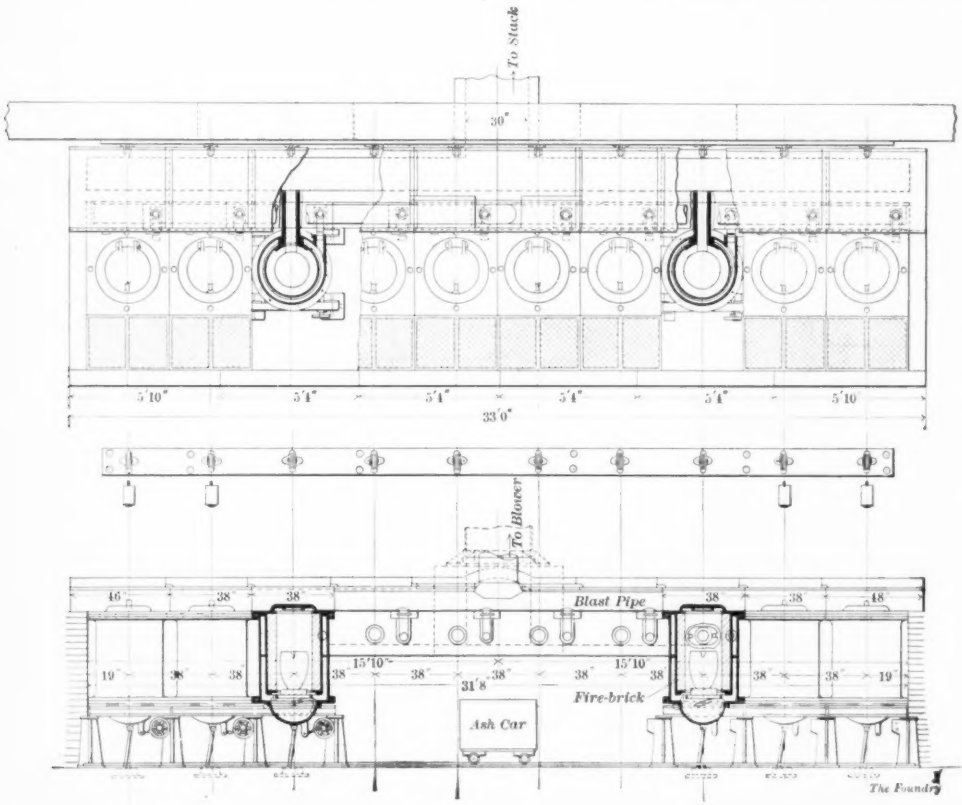


PLAN OF THE ROCK ISLAND BRASS FOUNDRY.

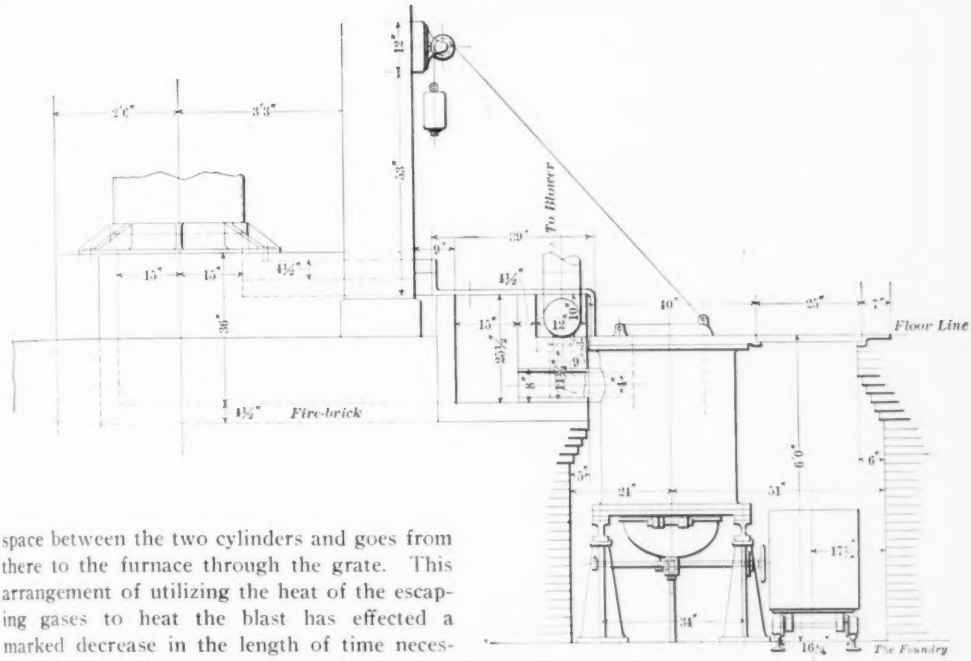
lined with fire brick in the usual way and has a square top forming a continuous platform, and also supporting the grating covering the pit. The outside cylinder has its lower end closed by a circular casting, provided with lugs, resting on the supporting beams, and also has a circular opening for the insertion of the grate. The lower opening in the furnace is closed by a bell shaped casting swinging on hinges and operated by a chain wound on a shaft which is held in position by a ratchet wheel and pawl, the surfaces of the two castings in contact are machined to form a reasonably tight joint. The one inch rod hinged to the bottom is a safeguard to keep the bottom closed. The furnaces are supported by cast iron beams and posts as shown in the illustration. No. 80 crucibles are used resting directly on the grates. The covers of the furnaces are counterbalanced to permit of easy removal. The bell shaped casting, which also serves as an ash receiver has a curved piece secured to its inner side, as shown, which serves to automatically lift the grate to place as the ash receiver is raised by means of the hand wheel. This receiver is made large enough to hold the amount of metal which could be placed in one of the crucibles should the same break during melting.

The forced draft is supplied to the furnaces by a centrifugal blower and conveyed through galvanized iron blast pipes and regulated by suitable blast gates. The gases of combustion leave each furnace through a six-inch pipe leading to a common flue lined with fire brick and terminating under a steel stack 30 inches in diameter and 50 feet high. The blast pipes and the flue are covered by castings forming a bench for storing metals to be charged into the crucibles, thus furnishing protection for the pipe as well as providing a handy place for the storing of metals and keeping each charge separate, so that confusion is entirely avoided.

It will be noticed from the illustrations that the blower pipes leading to the furnaces are laid in the conduit or flue provided for the escaping gases, and as a result the temperature of the forced draft when reaching the furnaces is materially raised. The blast enters the



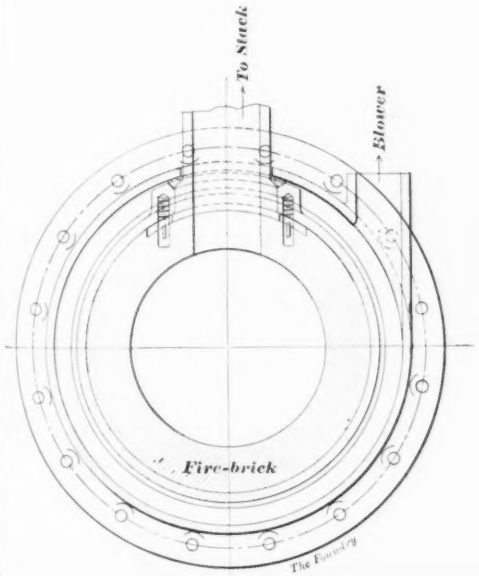
PLAN AND ELEVATION OF BRASS FURNACES IN THE ROCK ISLAND SHOPS.



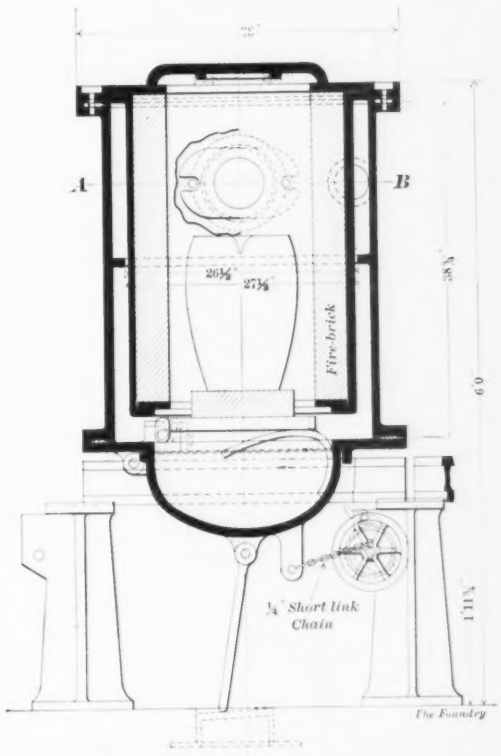
SECTIONAL ELEVATION OF BRASS FURNACE.

space between the two cylinders and goes from there to the furnace through the grate. This arrangement of utilizing the heat of the escaping gases to heat the blast has effected a marked decrease in the length of time necessary to melt a charge in the crucibles.

An ash car is provided in the pit underneath the furnace to receive any material which may have to be removed from same and when filled this car is hoisted to the floor through the medium of an air hoist. A hand hoist is provided for handling the crucibles, this being supported on an overhead rail. Although



Section at A-B

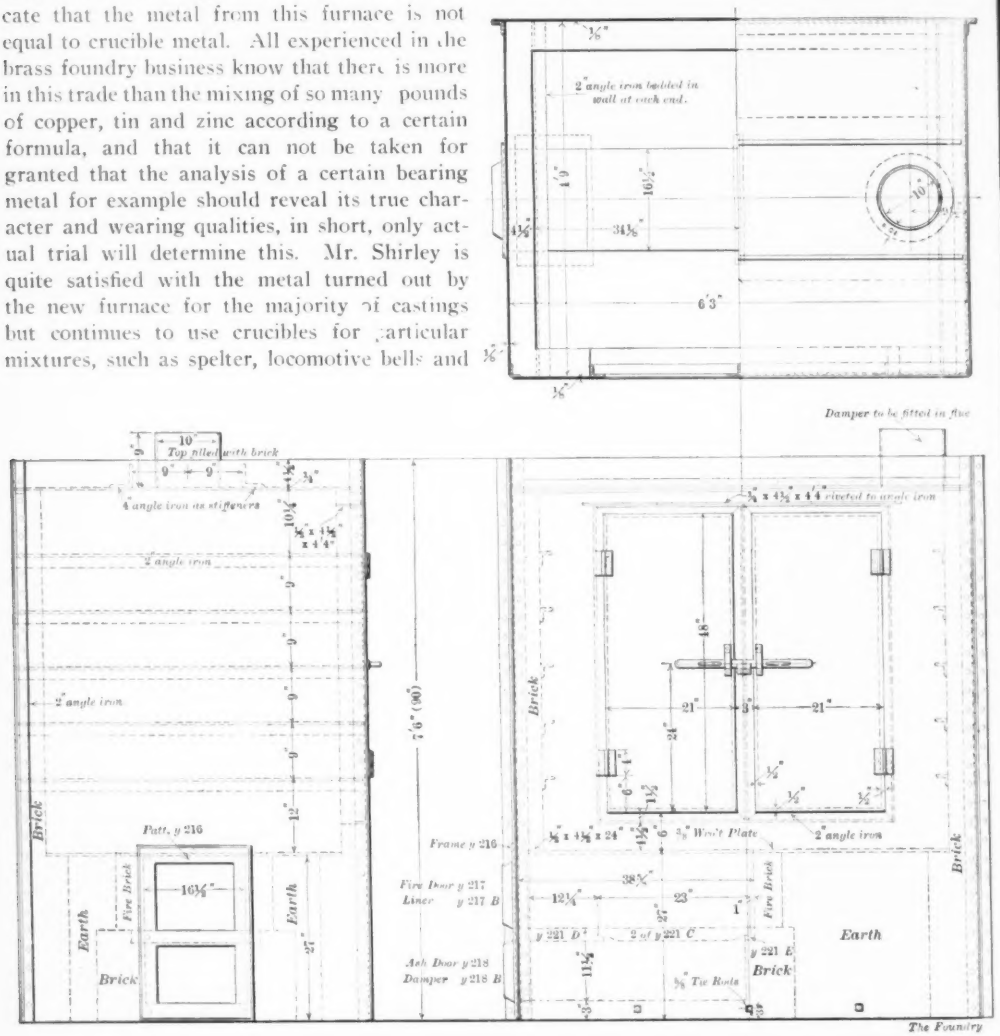


SECTIONAL VIEW OF THE ROCK ISLAND BRASS FURNACE.

air hoists are in use in a number of brass foundries for this purpose they were not deemed as satisfactory as hand power in this instance.

When it was decided to give the Schwartz furnace a trial the new thing was taken hold of with an earnest determination to find out what there was in it. The railway company's chemist assisted Mr. Shirley and after a few heats had been melted they succeeded in obtaining results quite satisfactory so far as the losses in the furnace were concerned. Whether the quality of the metal produced from this furnace is as good as that melted in crucibles is as yet to be determined through actual service. Suffice it to say that no physical defects have so far appeared which would indicate that the metal from this furnace is not equal to crucible metal. All experienced in the brass foundry business know that there is more in this trade than the mixing of so many pounds of copper, tin and zinc according to a certain formula, and that it can not be taken for granted that the analysis of a certain bearing metal for example should reveal its true character and wearing qualities, in short, only actual trial will determine this. Mr. Shirley is quite satisfied with the metal turned out by the new furnace for the majority of castings but continues to use crucibles for particular mixtures, such as spelter, locomotive bells and similar castings where the volume of metal wanted from one mixture is relatively small.

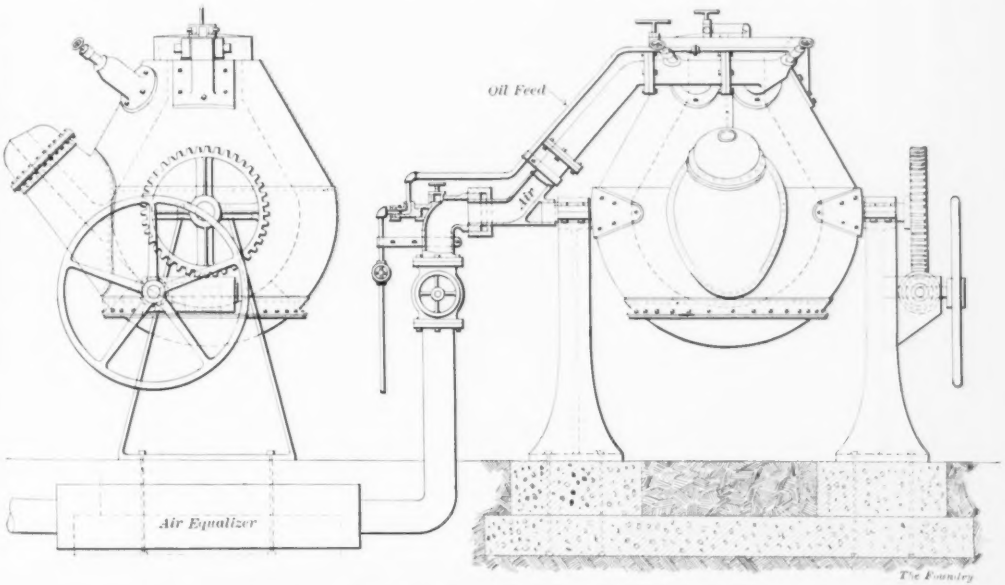
The Schwartz furnace, invented by Mr. Edward H. Schwartz, in appearance resembles a modified form of the Bessemer converter. The bottom part is bolted onto the main body and in lining the furnace this part is removed so as to conveniently reach the interior, when the furnace is turned upside down and the brick for lining same easily put in place. After lining the bottom is bolted on and the furnace reverted to an upright position when a ganister lining to cover the bottom can be inserted through the charging opening and rammed into place. This is usually made the same thickness as that of the balance of the lining.



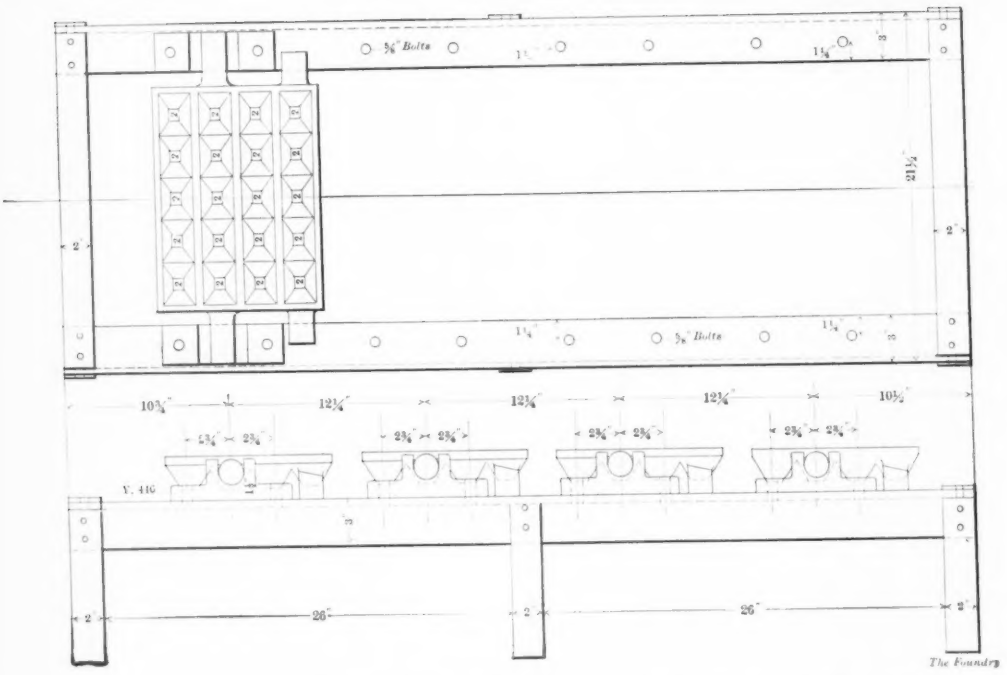
PLAN AND ELEVATION OF CORE OVEN IN THE ROCK ISLAND BRASS FOUNDRY.

THE SCHWARTZ MELTING FURNACE.

The furnace is mounted on trunnions and can be tilted to any position through a worm gear and suitable hand wheel. Through one of the trunnions the air and oil pipes connect with the ground lines through light stuffing boxes. The crude petroleum which is used as a fuel is forced through a three-quarter inch pipe from a steel tank holding about 60 gallons of



SECTIONAL VIEW OF THE SCHWARTZ MELTING FURNACE.



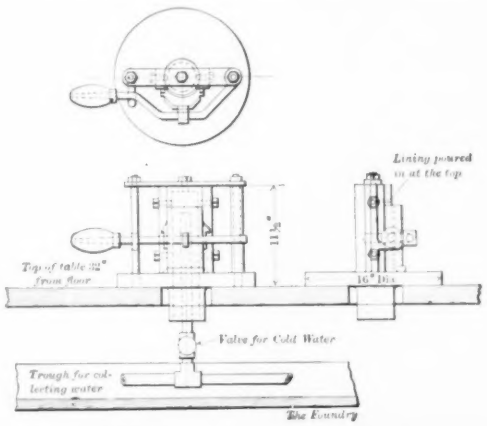
PLAN AND ELEVATION OF INGOT FORMER EMPLOYED IN THE ROCK ISLAND BRASS FOUNDRY.

oil, the air pressure employed for this purpose being about 40 pounds. The blast is furnished by a small pressure blower and both it and the supply of oil are controlled by suitable valves. The oil and air enter through separate tuyeres placed at an angle to each other near the top of the furnace and pointing downward, giving a rotary motion to the flame. The top of the furnace is covered by a brick lined hinged lid about 14 inches in diameter and through this opening the furnace is charged. When the furnace is in operation the brick lined spout through which the metal is removed is the only outlet for the products of combustion and the colors and behavior of the flame are about the only indications one has of what goes on inside.

Before charging, the furnace is heated to its working temperature and when the material necessary for a heat has been placed therein this is covered with a shovelful of anthracite coal as a protection against oxidation. It requires about an hour's time to melt from four to five hundred pounds, and when ready this is emptied into iron ladles the same as are used in an ordinary iron foundry, and from these poured into the molds.

Besides having charge of the brass foundry proper, Mr. Joseph Shirley also looks after the department which finishes the car brasses as cast and includes the boring, lining and babbitting of the same, the idea being to turn out of the foundry a finished product ready for the storehouse and then shipped wherever needed.

The facilities for lining and babbitting car brasses may be of interest to some of our readers and we therefore append some sketches showing how this is accomplished at the Rock Island shops. A battery of five large melting pots contains as many different kinds of metals, or to be more correct, four kinds of metals,



MANDREL FOR LINING CAR BRASSES.

as one of the pots is utilized in melting out the lining of old car brasses. The casing of these melting pots is built up of cast iron plates the interior being lined with red brick, the fireplaces being lined with fire brick. A large hood located overhead collects the smoke from the fireplaces and the fumes from the melting pots.

An ingot former devised by Mr. Shirley makes a handy and time saving arrangement, as will be seen from the illustration. Four of these formers are placed in cast iron bearings on a low bench built up of angle iron and plates. Two of these benches are placed together and white metal previously mixed in the right proportions and kept molten in one of the large melting pots before described is poured by a hand ladle into each of these eight formers. By the time the last one is filled the first have cooled sufficiently to be turned over with a quick motion and thereby emptied. The other ingots are turned over in succession and the first one emptied immediately turned back to the receiving position. The bottom of these formers have a plain number cast on as shown, each number indicating a different metal. This necessitates quite a number of formers but as these are very simple castings no objections have been found to keeping quite a few of them on hand.

Each car brass is first bored, then heated and tinned, and while yet heated placed in a vertical position on a cast iron mandrel turned to the proper diameter and supplied with lugs for the edges of the brasses to rest against, leaving a space to be filled by the lining. the metal for which is poured in with a dipper and the brass removed the moment this is set. The mandrel on the inside is kept cool by a stream of water circulating throughout its length. This simple means of keeping the temperature at a low point has escaped the notice of several imitators and instances are not lacking where this oversight has caused them considerable worry. Eccentrics, cross-heads, driving box brasses and the like are here babbitted and the thousands of white metal rings, used for piston rod and valve stem packings for all locomotives on this extensive railroad system are also manufactured in this department. It is probably well known that the Rock Island, as the route is commonly named, is fast becoming one of the most important systems of railroads in the great west. At this time it operates nearly 4,000 miles of railroad, 660 locomotives, 20,000 freight and about 500 passenger cars. The brass foundry to which we have just referred is the only one operated by the company and it will readily be observed that it forms a most important department

Fat Clay.

Ssemon Michailoff of Odessa, Russia, has been granted a patent in which one of the claims reads as follows: "A casting-mold, comprising one or more foundation-layers of a suitable material whose meeting edges form dovetailed grooves and a coating of a mixture of forty per cent burnt refractory clay, fifteen per cent burnt crucible-graphite, ten per cent fat clay, fifteen per cent sand, five per cent charcoal and fifteen per cent cow-dung mixed with water and boiled linseed oil, to be subsequently baked or fired, substantially as described." Readers of this journal will please preserve this information as it will not appear again.

Boil it Down.

If you have a thought that's happy,
Make it short and crisp and snappy.
When your brain its coin has minted,
Down the page your pen has sprinted,
If you want your effort printed,
Boil it down.

Take out every surplus letter—
Fewer syllables the better—
Make your meaning plain—express it
So we'll know, not merely guess it.
Then, my friend, ere you address it,
Boil it down.

Boil out all the extra trimmings—
Skim it well, then skim the skimmings—
When you're sure 'twould be a sin to
Cut another sentence into,
Send it on, and we'll begin to
Boil it down.

—*L. A. W. Bulletin.*

The W. B. Mitchell Skein & Foundry Co. is incorporated at Chicago with a capital of $30,000 by W. B. Mitchell, F. D. Jackson and G. N. B. Lowes.

The Alamo Engine Works, of Hillsdale, Mich., have had plans prepared for a foundry 40x80 feet and will let contracts for same at an early day.

The Burns Foundry & Machine Co. has become incorporated to do business in Brooklyn, N. Y., by Robert Burns, Wm. F. King and E. W. Smith.

CONTRACT.

In Consideration of the sum of One Dollar ($1.00) paid to the Acme Steel & Malleable Iron Works of Buffalo, N. Y., by ..... of ....., the receipt of which is hereby acknowledged, ... agree to buy all the malleable iron castings purchased for use in ..... business for the year beginning ..... 190 and ending ..... 190 , and the Acme Steel & Malleable Iron Works of Buffalo, N. Y., agrees to sell to ..... the malleable castings required for use in ..... business during the time covered by this contract, it being understood that the requirements will be ..... tons of castings.

Price Castings to be invoiced at ..... per lb., and fifth class freight rate allowed to .....

Payment Terms cash ..... days from date of invoice with privilege of deducting ..... per cent. for cash discount for payments made 10 days from average date of invoices.

Conditions This contract is made subject to the following conditions:

Specifications Specifications to be approximately-

.....

.....

.....

.....

The contract price is based on the above specifications.

Deliveries Deliveries to be made .....

.....

.....

Pattern Work Pattern work including charges for gating patterns to be invoiced as follows:

Labor	50	cents per hour
Pattern Brass	35	" " pound
White Metal	25	" " "
Grey Iron	6	" " "

Patterns Prices based on full gates of patterns for each shape made of brass or metal with iron core boxes to be furnished by consignee.

Orders Specifications to be not less than 200 moulds from one full gate on each order. Castings made from less than full gates of patterns or less than 200 moulds are to be invoiced at ..... per lb.

Grinding Castings are ..... to be sprue ground.

Straightening Castings are ..... to be straightened.

New Designs Castings from new designs and patterns not heretofore submitted, are to be invoiced at price agreed upon at the time the specifications for said castings are given.

Defective Defective castings may be returned at expense of consignor (shipped as scrap iron) and credit to be made at invoice price plus freight from Buffalo to destination no allowance to be made for labor or other expenses consignee may have incurred on the castings.

Claims All claims for defective castings are to be made within sixty (60) days after expiration of this contract.

Time Limit Consignee shall be entitled at contract price to all castings that can be moulded and annealed from patterns furnished, before the expiration of the time limit mentioned above.

Delays Orders accepted will be taken subject to delays in execution arising from fires, strikes or other causes beyond the control of the consignor.

In Witness Whereof the said parties have hereunto set their hands under the date set out opposite the signatures hereto.

Acme Steel & Malleable Iron Works.

By .....

Specifications for Castings.

Through the courtesy of E. G. Felthousen, proprietor of the Acme Steel & Malleable Iron Works, of Buffalo, N. Y., we show on opposite page a reduced facsimile of the form of contract in use between that company and its customers. It will be noted that there is a special clause in regard to specifications and in explanation of this it may be said that it has been customary for many years for foundrymen to quote a flat price on a miscellaneous line of patterns without regard to the specifications to be submitted, notwithstanding that the cost of producing castings from the different patterns involved may vary from 2½ to 20 cents per pound.

It has been the common experience of foundrymen, in all branches of the trade, who have been in the habit of bidding on work without having a definite understanding as to the character of the castings to be made, and the proportion of light and heavy castings, that the buyer almost invariably misleads the seller in regard to his probable requirements, and through such misleading statements induces the foundryman to make a flat price covering his full line of patterns, which in many cases causes the seller a serious loss. Then instances are not lacking where foundries having bid on work in a lump at a relatively low figure, have been deprived of the heavier castings for which, alone, others stood ready to contract at a still lower price, the foundry who bid on the whole, thus only receiving the lighter class of patterns and those on which an exceptional amount of core work or complicated molding had to be done, for which a higher price would have been asked.

The Acme Steel & Malleable Iron Works decided several months ago not to accept contracts at a flat price without approximate specifications and the result has been very beneficial to their profit and loss account. We have previously advocated in these columns that the only proper way to accept orders for castings is to insist that every casting made shall be sold at a price above actual cost. It is much more advantageous to lose an order than to complete it at a loss. The present time offers an opportune moment for foundrymen to adopt a more business-like method for disposing of their output. There never has existed a reason why the founder should sell his castings at a flat rate without specification. It is not asked for in other lines of manufacture and it is up to the founder to safeguard any bids he may make with such restrictions as will afford him greater protection against imposition on the part of buyers.

How to Make Perfect Iron Slip Boxes for Tapered Molds.

The Diamond Clamp & Flask Co., of Richmond, Ind., intends shortly to put on the market a tapered snap flask, hinged at right angles to the parting, and will also furnish patterns for slip boxes to be used on such molds. Referring to the molding of these Mr. W. N. Gartside, of the Diamond Clamp & Flask Co., sends us the attached illustrations and says that the easiest way of obtaining a perfect slip box is to fill the drag part of the flask with sand and strike this off level at the joint, then place the snap flask in the center, as is shown in Fig. 1, and ramming this full of sand when it may be taken off and this part of the mold,

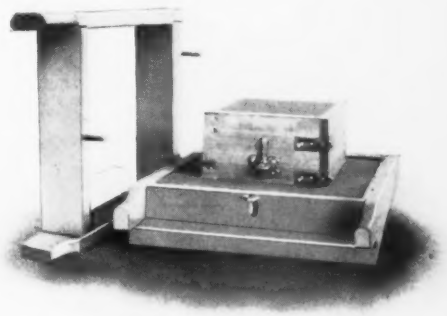


FIG. 1.

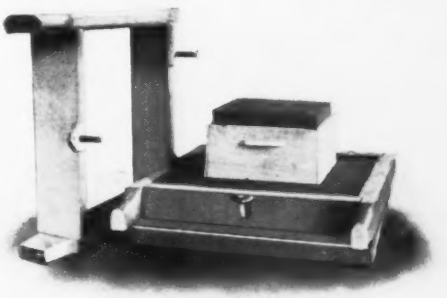


FIG. 2.

which forms the interior of the slip box, be left in good shape to be slicked and faced. The pattern for the slip box, which is in four pieces, is then placed around the mold, as shown in Fig. 2, when the cheek may be

rammed up and finished in the ordinary way. This method of molding is bound to give a slip box which is true to the flask for which it is to be used. As the outside of the box is not particular, it is not necessary to face it, and by having a "V" mark, as shown in Fig. 2, there will be no danger of turning the box end for end. If the slip box is to be used on a square mold with the proper taper to the flask, which should be one inch to the foot, no care need to be taken in regard to shrinkage, but if the box is to be used for a mold, say 12x24 inches, an additional one-eighth of an inch can be added to the end of the snap flask molds, before the patterns for the slip box are placed in position.

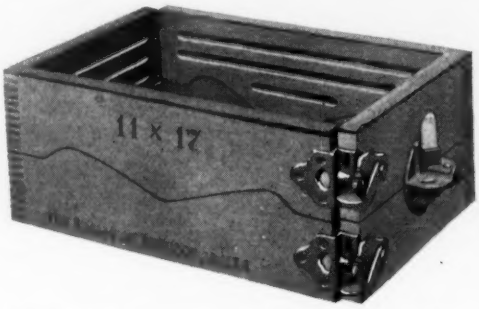
The dissatisfaction with tapered snap molds has been mainly due to the fact that users have not been careful to have the slip boxes fit the mold. In the method of molding these, as here illustrated, the box may be cast without the use of a cope, or in open sand, to use a shop expression.

Special Snap Flasks for Special Castings.

The building of special flasks to conform to the shape of patterns molded on the floor has long been recognized as a feature which has much to do with the economical molding of certain jobs. It is but natural that when the molder is relieved from ramming up unnecessary sand or from making parting lines which call for more or less securing of pockets, that the result should be an increased output of castings. On general principles any casting made in reasonable quantities should be molded in a flask requiring but the minimum amount of sand. In many cases the output of a certain pattern has been doubled and trebled through following this rule, without in the least increasing the amount of actual work done by the molder.

In the molding of that class of castings known as bench work there has not been the attention paid to special flasks which has been bestowed upon floor work, although there is no doubt but that the same policy would be as effective here. The Adams Co., of Dubuque, Iowa, realizing that this feature will be of help to light work foundries, are making a specialty of building snap flasks to meet the requirements of special castings and as an example of such we show herewith a snap flask with irregular parting which has permitted of a much more rapid molding of the casting for which it was made. It will be noted that this company marks its flasks with large figures plainly showing their size, which avoids confusion whenever any of these are wanted. The numbers are sunk in the sides of the flask and are not merely painted on as is usually the case, when the natural wear and tear soon deface them.

In light castings round patterns are generally molded in square flasks and to illustrate the



THE ADAMS SNAP FLASK WITH IRREGULAR PARTING.

economy of properly built flasks for this class of work we show with this a floor of round molds in which the circular flask used saved enough sand to make 33 complete molds. In other words, the round flask saved the molder from the labor incident to ramming up this amount of sand, preparing it for use and carrying it away from the bench in the shape of finished molds. The 18-inch circular flask has a cubical content of 1399.6 cubic inches against

THE ADAMS ROUND SNAP FLASK.

1782 cubic inches of the 18-inch square flask which would be required in the molding of this job.

The Adams Co. say that in the manufacture of snap flasks they are not attempting to compete in price with the general run of this class of goods to be found in the market. In their own foundry they have learned that cheap flasks are not only unsatisfactory when new but have proved expensive by the time their

A FLOOR OF ROUND MOLDS IN THE ADAMS CO.'S FOUNDRY, DUBUQUE, IOWA.

short lives are ended. The Adams snap flask is made from selected dry cherry, has machine locked corners and malleable trimmings throughout. The top irons have welded corners which give greater rigidity. The outside is finished in black shellac while the interior is given a heavy coating of oil and shellac.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

WHAT CHEMICAL COMPOSITION?

"Can you give me an idea of the best amounts of Sil., P., M., and Comb. Carbon which a light, but good sized, casting should have, one that has to be annealed several times before its final preparation for the market and the shrinkage of which must be low?"

Answer. This question reminds me of a case where a founder called and asked how to prevent small, thin, hollow castings from cracking. When asked what the castings were he said that they were soil pipe. He was instructed how to gate them and what kind of iron to use. The question of softness was raised but he was told that there was no need of using any tool on them. Some months after it leaked out that the party made radiators and found it difficult to make the iron hold water and at the same time be soft enough to be threaded. He did not want to have it known that he made radiators for fear that he might be asked to give some information that he preferred not to give, and thought the same information might be obtained by him through asking how to make soil pipe.

On reading the above question I wondered what kind of casting would have to be annealed several times. One annealing is usually enough to give softness and low shrinkage for any kind of machinery castings. About the only kind of castings that would fit the question would be such as are to be enameled, and as these are "good sized" the casting is probably a bath tub. There is no one question that is more difficult to answer than how to make a bath tub, with a uniform close grain, free from graphite on the surface and not burned under the gates, and which can be cleaned and leave a continuous metallic surface for the enamel to cling to.

The heating red hot would increase graphite which would often prevent the adherence of the enamel. Makers of pickling solutions and of sand blast machines and chemists have been working on this subject for years. Molders have tried all kinds of gating and yet it is very difficult to make bath tubs of first quality and to prevent the enamel from flaking off many of them.

The lower the silicon the more dense the surface; just a sufficient percentage to prevent cracking as the casting is heated would be best. Rather low carbon would be better than high. Phosphorus should not be over one per cent and manganese about half that amount. The annealing will reduce the combined carbon and the shrinkage sufficiently.

A casting (not for bath tubs, however), having 3.77 per cent carbon, of which 0.45 per cent was combined, had 1.78 per cent silicon;

P. 0.5 per cent; S. 0.04 per cent; Mn. 0.57 per cent. One annealing, taking 24 hours, reduced the combined carbon to 0.05 per cent and left all other elements unchanged. It reduced the shrinkage from .155 inch to .096 inch, took out half the chill and made the casting 30 per cent softer.

DECREASE IN COST OF CHEMICAL ANALYSIS.

It would seem a very wise move for chemists to reduce their rates for chemical determinations as an inducement to founders to make use of their services. The Foundrymen's Association of Philadelphia has an arrangement with a chemist whereby its members get a 40 per cent reduction from regular rates. But the chemists would do themselves a great deal of good if they would explain, in language that could be understood by the founders now in charge of shops, how to figure mixtures containing the shop's return, scrap and two or more kinds of pig iron. The amount of return is a constant quantity, and as it is desirable to use considerable scrap that also may be made a definite amount. In a 1,000-pound mixture, with 2.25 per cent silicon, how shall the amount to be used of the two pig irons be determined? The castings are for light machinery and are to be machined. What is the most economical scrap to be used and how shall its silicon be estimated?

In making purchases of pig iron what amount of silicon should be specified to make the cheapest mixture?

The above should be made so intelligible that every founder could understand it. Then more would learn to mix iron in that way.

It is of little value to tell a founder how to find the silicon in his mixture, viz.: to multiply the weight of each iron used by the percentage of silicon in each, then divide the sum of the products by the total weight.

What a founder wants is a simple way of finding how much of each kind of iron to use to produce a desired percentage of silicon in his mixture.

The explanations given thus far have not been simple enough for the founder to understand.

SKINNINGROVE BRAND OF PIG IRON.

In "Cast Iron Notes" for March this iron was called Skillinggrove and the total carbon was given as 2.99; graphite 2.75; C. carbon 0.24. The makers say that carbon is rarely lower than 3.43, with graphite 3.34 and C. carbon 0.09.

Phosphor-Bronze for Hydraulic Castings.

It is very often difficult to find a satisfactory mixture for castings which have to withstand very high pressures. In the iron foundry this class of work requires a very close-grained metal and even with this the special design of the casting may throw unforeseen difficulties in the founder's way. When we enter the brass foundry these are generally intensified and a really fine looking casting may be worthless, while a rough specimen of the molder's art is accepted, because it is solid. In a recent issue of the *Aluminum World*, Erwin S. Sperry takes up some of the troubles encountered by brass founders in turning out hydraulic castings, as follows:

There appears to be so much misconception in regard to the manufacture of castings for the purpose of resisting the high pressures produced in hydraulic machines that the time appears opportune for a few comments on the subject. Reference, of course, is only made to the non-ferrous metals and alloys; the use of cast iron for this purpose is without the province of the paper.

Some manufacturers seem to think that a metal of high tensile strength is all that is required for the purpose of resisting pressure, others believe that only a certain mixture will give the required results, while still others fancy that the element of luck enters almost exclusively into the problem. One person says that he has tried all the proportions of copper and tin without success and that he has been advised to try the addition of a small quantity of nickel as an antidote for the trouble. Such remedies, however, are generally applied without making a thorough diagnosis of the trouble and, if the molder happens to have good luck in his work for the time being, it is imagined that this addition has solved the problem. The difficulty is again encountered, however.

The obstacle which is met with in the manufacture of castings to resist hydraulic pressure is the sweating of the liquid through the pores of the metal when the pressure is applied. For this reason castings, which for ordinary purposes would be perfect, are necessarily rejected. How to remedy this defect often gives the maker many an anxious thought.

Theoretically, the tensile strength of a metal or alloy has no influence on such sweating and the only object of preferring a strong metal is its ability to resist deformation when pressure is applied.

As for the superiority of one metal or alloy

over another let it be said that, provided a perfect casting can be made, there is no more virtue in one mixture than another. It is the imperfect or unsound castings which cause the difficulty and is not inherent in the metal itself. For the reason that more perfect castings can be produced from certain mixtures than from others explains the fact that all alloys do not produce equal results.

The imperfections in sand castings which render them unfit for this use may be classified as follows:

1. The existence of oxide, dross or other foreign matter in the casting itself.

This is by far the most frequent cause of sweating and the material which is present in the casting acts as a channel for the liquid to pass through. This difficulty is more prominent in aluminum and its alloys than in other metals and, for this reason, the use of any alloys containing aluminum is to be avoided for this class of work. The great affinity of aluminum for oxygen causes this phenomenon and, unless some method can be found to cast aluminum and its alloys in an atmosphere free from oxygen or in a vacuum, a certain quantity of the oxide is invariably drawn in with the metal.

The manufacturer often says, in regard to his leaky castings: "They turned up as soundly as any castings I have ever seen, yet they leak badly, when pressure is applied." An imperfection which will allow water or other liquids to pass through at several thousand pounds per square inch and not at a lower pressure is hardly visible to the naked eye or even with a magnifying glass. Then, too, the machining closes it up more or less.

The removal of such oxide, dross or equally injurious material from the metal before it enters the casting is more of a mechanical problem than a metallurgical one and can be carried out to a certain extent by means of suitable skim gates, gating from the bottom, adding risers to carry off the entangled foreign matter. The most satisfactory method, and one by which the most perfect results can be obtained, is to use an alloy which is not capable of forming an injurious oxide when melted. There is, then, a clear surface to the metal and, if properly skimmed, no foreign substance enters the mold. This alloy is found in suitable phosphor-bronze mixtures.

2. Crystallization of the metal in the casting. When such a condition exists it is known as sponginess or soft spots and is caused by the metal or alloy forming well defined crystals. They usually occur in the portion which cools last and especially in such places as the middle of a casting where there is a tendency of the metal to draw away from itself. They are, by far, more frequent in the alloys of copper and zinc or copper, tin and zinc than in the simple alloys of copper and tin and, for this reason, better results will be obtained by leaving zinc from the mixtures.

Pouring the metal at as low a temperature as possible tends to obviate crystallization as in such a procedure the metal does not long remain liquid in the mold. A casting made in a chill mold is, for this reason, much finer grain than one cast in sand.

3. Blowholes in the casting. These are usually caused by overheating the metal or allowing it to remain too long in the fire after it is melted. It is readily understood how a blowhole may cause leakage.

4. Shrinkage cracks. Such difficulties are caused by the metal tearing away from itself, either from the sand being rammed too hard, the cores unyielding, pattern not having been properly made, or similar conditions.

For the reason that it is practically free from any oxide film when melted, phosphor-bronze is, *par excellence*, the alloy for this class of castings. I do not mean all phosphor-bronze, for there exists much diversity in this respect, but suitable mixtures. It may be said that with such proper phosphor-bronze mixtures, the results which are obtained will be as perfect as it is possible to make them. If any obstacles are encountered the difficulty lies without the mixture.

The formulæ usually recommended for phosphor-bronze, especially those given by the makers of phosphor-tin, contain too much phosphorus. It is also often recommended to increase the amount of phosphorus as the tin is increased. Such instructions are misleading and wrong; as a matter of fact, the phosphorus should decrease as the tin is increased. If one desires to experiment in this line he will find that it takes much more phosphorus to render a copper casting sound than it does in an alloy of copper and tin.

The function of the phosphorus in a copper and tin alloy is not readily understood. It is to remove the film of oxide from the surface and that dissolved in the copper. Any further addition than the quantity necessary to do this, is not only useless but injurious. Phosphor-bronze which contains an excess of phosphorus almost invariably has blowholes in the sand castings. The amount of phos-

phorus which is recommended for use in phosphor-bronze ranges all the way from 0.05 per cent to an amount as high as 2 per cent! The latter quantity is far in excess of any intelligent amount and sound castings can not be made from such a mixture. Indeed much difficulty is experienced in casting phosphor-bronze containing 0.75 per cent of phosphorus. Liquation occurs and the sand casting is liable to be filled with blowholes.

For mixtures which contain from 10 to 12 per cent of tin an amount of phosphorus equal to about 0.10 per cent is really all that is necessary, yet in sand castings the sprues, risers and defective castings have to be remelted and, on this account, more phosphorus is necessary than would be were a fresh melt made every time. The quantity which will give good results in such instances I have found to be 0.25 per cent and I have been accustomed to use this quantity in work of such a character.

As for the tin, the maker can suit himself to a certain extent. If more hardness is desired increase the tin; if a softer alloy is sought decrease it. Do not change the phosphorus, however; the 0.25 per cent is suitable for castings containing up to 12 per cent of tin. If the amount of tin is increased above this percentage the phosphorus should be reduced.

Generally speaking the formula for making sand castings to be used to resist hydraulic pressures should be the following:

	For a Tough Alloy.	For a Hard Alloy.
Copper	90.00 per cent.	87.50 per cent.
Tin	9.75 per cent.	12.25 per cent.
Phosphorus.	.25 per cent.	.25 per cent.

If phosphor-tin is used which contains 5 per cent of phosphorus the proportions are as follows:

	For a Tough Alloy.	For a Hard Alloy.
Copper	9 lbs.	8¾ lbs.
Tin	½ lb.	¾ lb.
5 per cent phosphor-tin.	½ lb.	½ lb.
	10 lbs.	10 lbs.

It is preferable to keep lead out of the alloy as there is then a tendency toward liquation and segregation. Although a slight addition of this element would render the metal much more free in cutting, yet the quality of the castings is much improved by such an omission.

Zinc should be kept out of phosphor-bronze as it does not improve the alloy. At the same time phosphorus should not be introduced into brass alloys. These statements, perhaps, may be qualified by saying that very minute amounts of phosphorus (.01 per cent) often improve gun metal (or copper-tin-zinc alloys) in certain ways and for certain purposes. As a rule, however, phosphor-bronze should be free from zinc.

To make these phosphor-bronze mixtures the copper should be melted under a good layer of charcoal and not allowed to get too hot. Add the pure tin and then the phosphor-tin and stir well with a plumbago stirrer (phosphor-bronze rapidly attacks an iron skimmer). The metal is now ready for the pouring.

A list of the alloys, which on account of their possession of the requisite tensile strength are suitable for making hydraulic castings is herewith appended. They are arranged in the order of their value for the purpose and commence with the alloy most adapted for the work.

1. Phosphor-bronze (free from lead and zinc).
2. Phosphor-bronze with small amount of lead.
3. Gun metal (copper, tin, zinc).
4. Composition and steam metal (copper-zinc-tin).
5. Yellow brass with or without tin and lead.
6. German silver.
7. Manganese bronze.
8. Aluminum brass.
9. Aluminum bronze.
10. Aluminum.

If a casting made of phosphor-bronze only leaks slightly under pressure it may sometimes be stopped by drying out the water, heating and soaking it in melted paraffine. The paraffine fills the imperfections and thus renders it impervious. Treating copper alloy castings with sal ammoniac, as is often done with iron castings, does not affect them. In the iron castings a rusting or oxidation is produced which fills the pores of the metal.

The North & Judd Mfg. Co., of New Britain, Conn., will build a brass foundry 60x120 feet.

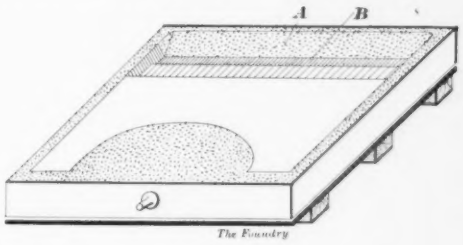
The plant of the Hamlin Car Wheel & Mfg. Co., at Catawissa, Pa., changed hands recently, and it is expected that the new management will make several improvements.

Bowen & Quick have purchased the foundry at Union Springs, N. Y., formerly operated by J. O. Spencer.

Gaggering.

One of the many points that a foundry foreman should be familiar with, is the important part of the trade known as gaggering. Take for example a boiler front, half an inch thick, and about six or seven feet square; when made in a rigid iron flask, gaggers can be used six or seven inches apart, laid in sand which has been riddled on pattern to a depth of ¾ inches or more. The only duty required of the gaggers in this instance is to support the upper face of mold to prevent a "drop out." But substitute a bedplate of the same area, and five or six inches thick, and apply the same method of gaggering, and what is the result. After the mold is poured, the discovery will be made that something familiarly known as a "draw down" has occurred. In other words, the sand has been drawn down from the cope, to the depth of ½ or ¾ inches, during the process of pouring, and will be found scattered throughout the casting. But the same procedure will be used in both instances by the "specialist" and also by the molder who is slow to perceive. In the language of the Dutchman he will exclaim, "Who is the reason?" The reason is apparent. It is a well known fact that moisture used to a certain degree is what gives molding sand its adhesiveness. Remove this factor, and the sand becomes like ashes, losing its tenacity. (I am speaking now of green sand only). In casting the boiler front, which must be poured rapidly to avoid chilling of the iron, ere it reaches the extreme outer edges, the mold is filled before the molten iron has a chance to absorb this moisture, hence a "draw down" on such a job is unknown. But with the bedplate the conditions are different. Being much heavier, and no necessity for hard pouring, a much longer time is consumed in casting, which gives a "golden opportunity" for this draw down to take place.

What is the remedy? When ready to ram up cope, just enough facing sand should be riddled on pattern to cover same, thereby bringing gaggers as close as possible to pattern, the gaggers in this case having a double duty to perform; namely, to provide against a drop out, and also a draw down. The gaggers must be set close together, not more than 2½ or 3 inches apart. In some shops where a poor grade of sand is used, it is necessary to nail the upper face of mold when casting heavy pieces, but with a fair grade of sand the former method is all that is required. No doubt this riddling on of sand to the depth of ¾ inch or more, seems excessive, and certainly is, but it is done by the molder to prevent the gaggers from falling over, as they very often do when a smaller quantity of sand is used under them. This excess of sand under gaggers often proves disastrous even to boiler fronts of a certain style. The illustration shows a boiler front pattern with cornice attached, with joint ready for parting sand, which makes the parting at A almost perpendicular. In riddling on joint, considerable sand



GAGGERING.

will roll down into this V-shaped parting, so that if the sand riddled on body of mold averages 5/8 to ¾ inch, it will exceed 1 inch at B. In pouring this front, being gated in the circle, the metal will strike this narrow neck of sand at B fairly and squarely, invariably washing parts of it away, thus adding to the scrap pile, but not to the molder's peace of mind.

H. W. BURY.

The Proper Temperature at which Cast Iron should be Poured.

We are confronted with two different theories as to the temperature at which melted iron should be poured in order to insure solid castings. One side insists that to produce sound castings iron should be poured hot, the hotter the better. The other holds an opposite view and claims that to obtain the best results iron should be poured just hot enough to run properly and that as long as it fills the mold perfectly the less heat the metal contains the better. Which is right? MILLER MFG. CO.

The Krank's Korner.

On the following page is shown a rather neat advertisement which appeared simultaneously in a number of leading dailies. Of course the object of this announcement is to call attention to the merit of this concern's stock as an investment, yet I believe that if I had a man who could write good advertisements that I should utilize him in getting up some-

THE OLD WAY

SINCE the days of Tubal Cain, up to a few years ago, it was necessary to produce the strongest parts of metal work by hammering. In the olden days the heated metal was laid on one flat stone and hammered with another, or with a primitive sledge. The flat stone developed by slow stages into a block of metal, at first square and unhandy, but as time passed and men developed ingenuity the block grew a nose and became an anvil, by means of which the blacksmiths of old shaped curved articles. They fashioned horse-shoes, linked chain-armor, and welded blades. From the old-time armorer, the blacksmiths and other workers of metal, whose sturdy blows rang music from the anvil, is descended the ponderous trip-hammer—pouderous, yet so delicately adjusted that a blow can be struck as light as air, and one so mighty that a block of granite is crushed to powder. Invention has succeeded invention until the rude flat stone has developed into a die, carefully and laboriously cut and shaped by hand, into which the glowing metal is forced, not by the sinewy arm of a modern Tubal Cain, but by the power of steam through tendons of steel or by the pressure of water squeezing the metal into shape. All are modifications of the old brawny arm and skillful hammering method. Slow, expensive, and subject to ruinous misplaced blows and defective machinery, it is a process that is still retained only because none better had been discovered. Even with the most modern machinery, with the aid of wonderful trip-hammers, of powerful hydraulic presses that mould metal as a sculptor models clay, the process is costly and slow, the machines enormous or delicate, needing adjustment, whether one or fifty pieces are to be produced. The die must be cut with the finest skill by hand out of steel as hard as flint. And after all this the article must often be tempered, annealed, or planed before it is ready for use.

Such is the old process of steel production—the process of Tubal Cain, grandson of Methuselah.

AND THE NEW

THE new steel process is a short cut to the result wanted. From the enormous melting furnace to the finished article is but one step by the Jupiter Steel Process. Scarcely five years ago two metallurgists discovered a method by which scrap steel (discarded machinery, old boiler plates, broken crank shafts, and the like), melted and mixed with certain ingredients and poured into a simple mould of special sand, produced steel equal, in strength and temper, to forgings vastly more expensive. By this means old scrap steel of little value is transformed into tools capable of holding the finest edge or into immense castings of the greatest strength and the toughest fibre. Like all great and successful inventions its simplicity makes it profitable. All the time-wasting, expensive processes of forging, tempering and annealing are avoided. Carefully measured ingredients are introduced into the boiling mass of steel scrap, and the finished cast will have all the qualities of the best tool steel or the forged and turned engine crank, as you wish. The secret lies in the mixture which the modern alchemists, Messrs. Whall and Lundin, have discovered; and the United States Steel Company own the patents thereon, in this and twenty-three foreign countries.

The public is slow to take advantage of a revolutionary invention, but once its efficiency is proved the public rushes to profit by it—as in the case of the trolley and the telephone.

The plant of the United States Steel Company is at Everett, almost within the city limits of Boston, in the very heart of the manufacturers of New England, who are taking more and more advantage of a manifestly good opportunity to exchange their broken steel machinery for new parts cast within a short distance of their doors. Not only is the cost of the parts reduced, but valuable time and freights to the steel mills of Pennsylvania are saved.

So popular has Jupiter Steel become that it is necessary to enlarge the plant to five times its present capacity, the main building being two hundred feet long by one hundred and thirty feet in width, and government work and local orders have multiplied until there is on hand sufficient work of the most profitable description for six months ahead. The works are in charge of Mr. Eugene Edwards, formerly superintendent of the steel-casting plant of the well-known General Electric Company at Lynn, Mass., and Mr. Benjamin A. Franklin, until recently superintendent of the steel-casting department of the Midvale Steel Company of Pennsylvania (valued at $20,000,000). Their combined and long experience gives the Company the advantage of a rare combination of expert talent.

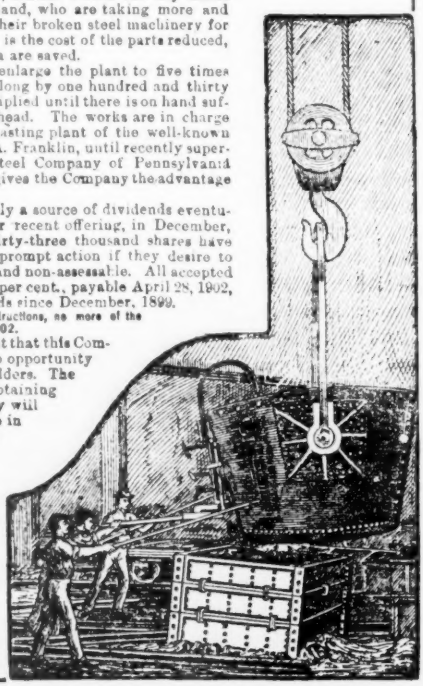
The foreign patents, now being negotiated, show conclusively a source of dividends eventually equal to the entire capitalization of the company. Of their recent offering, in December, 1901, of forty thousand shares at par, **$5.00 per share**, over thirty-three thousand shares have been subscribed for; and any intending investors should take prompt action if they desire to take any more of the remaining stock at the same price, full paid and non-assessable. All accepted subscriptions will draw the full regular quarterly dividend of 8 per cent., payable April 28, 1902, the Company having paid regular **12 per cent. per annum** dividends since December, 1899.

☞ As the Company requires but very little more capital for its new constructions, no more of the Treasury Stock will be sold at $5.00 per share after the dividend of April 28, 1902.

We desire to call the attention of those interested to the fact that this Company has no bonds or preferred stock, and that there is, therefore, no opportunity for any interests combining and "freezing-out" smaller stockholders. The Company has always been conducted from the standpoint of obtaining the confidence of stockholders, large and small, for that policy will certainly bear best fruits in the long run. Also that there are in the treasury two hundred and ten thousand shares of stock, and that the Company owns seventy-four acres of good manufacturing land, finely located and having unexcelled railroad and water facilities. The officers of the Company are not stock-brokers or promoters—just plain business men engaged in establishing what is destined to become a large and profitable New England industry, in which they invite you to participate. Upon request they will be pleased to send a full prospectus of the company, together with photographs and a record of what has been accomplished in the past two years, and such information as an investor may desire, and bank reference if required.

Preference will be given to subscriptions in the order of their receipt. Make all Checks, Drafts, or Money Orders payable to

THE UNITED STATES STEEL COMPANY,
140 Oliver Street, Boston, Mass.



thing which would bring me business at good prices. There is much room along this line for improvement as far as foundries are concerned.

I have before me one of Mr. Lundin's patents, and as undoubtedly quite a few readers would like to become better acquainted with the mixture of which Jupiter Steel is composed, I reproduced the following from Mr. Lundin's description of same:

"The present invention is particularly adapted for the manufacture of heavy or large castings, such as crank-shafts, cross-heads, etc. I take steel scrap and melt it and add copper, ferrosilicon, ferromanganese, and aluminum in the manner and proportions indicated by the following example of manufacture: 100 pounds of steel scrap is placed in a crucible in a furnace and melted to a boiling point—say about 4,000 degrees Fahrenheit. When the boiling-point has been reached, 1 to 4 pounds of copper is placed in the molten metal. When the copper has melted, which occurs in fifteen minutes or more, 1½ to 2½ pounds of ferrosilicon containing 12 per cent silicon is thrown into the molten metal. After the ferrosilicon has melted 2 to 8 ounces of ferromanganese containing 80 per cent manganese is mixed with 3 pounds or less of aluminum and this mixture is thrown into the molten metal, in which it quickly melts. The resulting composition or alloy is, after all its constituent parts are melted, poured into a mold and cast into the shape desired.

"It will thus be seen that the percentage in weight of the ingredients added to the molten metal is substantially as follows: copper, 1 per cent to 4 per cent; ferrosilicon containing 12 per cent silicon, 1.5 per cent to 2.5 per cent; ferromanganese containing 80 per cent manganese, .125 per cent to .5 per cent; aluminum, 3 per cent or less.

"It will readily be seen that the product of the above-described process is a trifle over 100 pounds of metal—probably not more than 103 to 107 pounds—containing an addition to the original 100 pounds, of copper, 1 pound to 4 pounds, equaling 1 per cent to 4 per cent; pure silicon, 2.88 ounces to 4.8 ounces, equaling .18 per cent to .3 per cent; pure manganese, 1.6 ounces to 6.4 ounces, equaling .1 per cent to .4 per cent; aluminum, 3 pounds or less, equaling 3 per cent or less, and the iron which bore the silicon and manganese.

"Of course I do not confine myself to the employment of ferrosilicon or ferromanganese with the exact proportions of silicon and manganese mentioned; but if I use ferrosilicon containing a greater or less percentage than 12 per cent of silicon, or ferromanganese containing a greater or less percentage than 80 per cent of manganese, I vary the proportions of ferrosilicon and ferromanganese inserted in the molten metal, so as to produce the above-mentioned proportions of pure silicon and pure manganese—viz., .18 per cent to .3 per cent of pure silicon and .1 per cent to .4 per cent of pure manganese in the product.

"I am aware that it is not broadly new in metallurgy to apply ferrosilicon or ferromanganese in certain proportions to molten metal, and I am also aware that aluminum has been used as an alloy in the manufacture of iron and steel. In this invention it should be understood that the improvement relates to the manufacture of steel castings and also that the range of proportions above mentioned is essential in effecting the desired result.

"In the example of manufacture given above I have mentioned that the scrap is melted in a crucible. I do not, however, confine myself to the employment of a crucible, as the scrap can be melted by the open-hearth process, if desired.

"Having thus fully described my invention, what I claim as a new article of manufacture, steel castings containing an admixture of from 1 per cent to 4 per cent of copper, .18 per cent to .3 per cent of silicon, .1 per cent to .4 per cent of manganese, and 3 per cent or less of aluminum."

It will be noted that Mr. Lundin's patent covers quite a wide range in the use of different elements. Thus 3 per cent or less of aluminum, and 1 to 4 per cent of copper, really tells nothing. However if one can secure a patent without revealing anything, he has double protection. There is also this much about it, if this plant keeps on growing it may not continue to be able to find enough old scrap of little value to keep running, in fact, scrap prices are not at the present time any too low.

Reference is made to the molds of special sand and touching upon this part of the casting of Jupiter Steel, another journal comes forward with the information that the molding sand is composed of a sharp silica sand, crushed rock, fireclay and molasses, which are mixed in the following proportions: Sixteen shovelfuls of hard silica sand, four of crushed rock, one of fireclay, and one and one-half pints of molasses water, the molasses being

diluted with water in the proportion of one to one. The molasses is used to give a bonding effect to the sand during the molding, while the fireclay serves the same purpose during the pouring of the hot metal. After the pattern has been drawn from the mold the latter is carefully dressed up and the finished surfaces are treated with a wash consisting of 99½ per cent of pure silica, ground fine and mixed with molasses water.

Now you have been told how Jupiter Steel castings are made. Take care that you do nothing which will make you liable for infringement.

* * *

In describing the foundry industry of Scotland, an individual signing himself Benjamin Taylor, F. R. G. S., Glasgow, says that "the general iron-founding trade of Scotland has innumerable branches, such as sugar-pans and batteries, round pans, coolers, vacuum pans, round and square tanks and coolers, bleaching boilers, soap-pans and boilers, stills, chemical pans, oil retorts and refineries, castings for marine engines and for land engines of all sorts, hydraulic presses, etc." It is too bad that the foundry trade of Scotland should be thus handicapped. Get the branches together under one roof, ye Scots.

* * *

I recently came across the advertisement of a certain compound or flux, of which five pounds, costing five cents a pound, were required to each ton of iron melted, for which the following claims were made:

"When iron is reduced to a fluid state a certain amount of carbon is removed by the heat, and the weight of iron reduced; this is prevented to a large extent by the use of compound, and the per cent of iron lost in melting, greatly reduced.

"The compound gives life and fluidity to molten iron—greatly increasing its flowing properties and reducing its chilling tendency.

"Iron is softened and strengthened to such an extent by the use of the compound that a lower grade of pig, or an increased amount of scrap, may be used for the finest grade of castings.

"The compound gives life and fluidity to molten iron, thereby facilitating escape of dirt and dross from the iron, and cleaner castings are made, when it is used.

"The cupola lining is glazed and protected by the compound, and slag adhering to the lining rendered brittle and more readily removed.

"When used in connection with limestone in long heats, the compound renders the slag more fluid and brittle, and facilitates its removal."

Thinking that perhaps it would be interesting to learn the opinion of others on this subject I asked a well known metallurgist to give his conclusions as to the general utility of various fluxes and have the following reply:

"If a flux reduces the chilling properties of iron then the flux must either increase the silicon or aluminum or decrease some of its other ingredients. Now five pounds in a ton would if it were silicon increase the amount to but .25 per cent. But there is no such thing as the element silicon that can be added to iron in such a manner.

"If it adds or takes away anything from the iron then it is such a small amount that in ordinary iron it would not be noticeable.

"Again if all should enter the iron then there would be nothing that would affect the lining of the cupola or make a fluid slag.

"All that these compounds can do that I see under the temperature usually found in a cupola is to make the slag more fluid and, of course, such ingredients as common salt and many alkalies as well as fluor spar will do this and the price of these is surely less than five cents a pound to the foundrymen.

"I do not wish to convey the idea that I condemn all the different fluxes that are on the market, but I do at any price that I ever have had them offered to me.

"When the iron is dirty, then often common sand helps to flux the cupola. In connection with limestone, fluor spar is good and answers very well."

Among the Foundries.

The foundry at Hanover, Pa., formerly conducted by the American Machine & Foundry Co., has been overhauled by their successors, the American Foundry & Machine Co., and provided with every equipment belonging to an up-to-date shop. The heavier class of castings will be made a specialty, particularly cylinders of a high grade. The concern has only been recently organized with the following officers: Thos. M. Brown, president; Hanson Robinson, vice-president, and Paul Zieber, secretary and treasurer. These gentlemen formerly conducted the American Machine and Foundry Co., whose interests have been moved to Brooklyn, N. Y., conducting there a machine shop only.

The Copper Queen Consolidated Mining Co. are now erecting large works at Douglas, Ariz., and upon their completion the plant at Bisbee, Ariz., will be abandoned. The foundry department will be equipped with electric traveling crane and otherwise brought up to an efficient standard. Reverberatory oil furnaces are now being successfully employed in copper smelting throughout this region, where the oil fields of California and Texas have helped to overcome the high prices of coal and coke.

Fred Jones has retired from the Jackson Foundry & Machine Co., Jackson, O., having sold his interest to his partner, Frank Gray, who will continue the business.

The capital stock of the Gate City Stove Works, of Catlettsburg, Kv., has been increased from $2,000 to $10,000.

It is reported that Robert K. Story, formerly of the Central Foundry Co., has purchased and will shortly reopen the old Phoenix Soil Pipe plant at Lansdale, Pa. It is now being overhauled with a view of resumption.

The Eureka Foundry & Machine Co. have been organized at Birmingham, Ala., with a capital stock of $5,000. The incorporators are George W. Stirling, Richard H. Pritchard and Harvey T. Lankford. They will do a general foundry and machine shop business.

Thomas J. Drummond and Edgar M. McDougall have formed a partnership at Montreal, Canada, to do business as the Canadian Iron & Foundry Co.

The Franklin Rolling Mill & Foundry Co. are being organized at Franklin, Pa. The capitalization of the new concern will be $750,000.

The Naylor foundry at Cold Spring, N. Y., has been sold to William G. McCrea, of New York. It is understood that additions will be made to the plant and the output increased. The name of the new firm is the Szekely Brake Shoe & Iron Mfg. Co., who will make a specialty of turning out brake shoes by an improved method.

The well-known firm of Noyes & Goddard, stove founders, Waterville, Me., consisting of E. D. Noyes and J. P. Goddard, has dissolved partnership. Mr. Noyes will continue the business under the name of the Noyes Stove Co.

The St. John Foundry Co., Ltd., of St. John, N. B., has been incorporated with $6,000 capital. J. E. Wilson, R. Maxwell, R. Rachford, James Keenan, Charles Cobham, E. McLaughlin and C. Rachford are the incorporators.

The Century Stove & Mfg. Co. has been formed at Johnstown with $100,000 capital, and will build a large plant. The directors are R. D. Wilson and Robert Monroe, of Pittsburgh; Edrick C. Warren, John H. Waters and Samuel B. Waters, of Johnstown.

Final arrangements have been made for the removal of the foundry of the Fischer Foundry & Machine Co. from Pittsburg to Connellsville, Pa. The plant is to cost $125,000 and will be completed some time in the fall.

The Standard Mfg. Co., of Galesburg, Mich., who have been engaged in the manufacture of wind mills and a general foundry business for several years, have been reorganized into a stock company with a capital of $200,000 and will enlarge the capacity of their plant.

The Chisholm & Moore Mfg. Co., of Cleveland, O., will add to their foundry department a building 100x63 feet.

The Utica Pipe & Foundry Co., of Utica, N. Y., have let the contract for a material enlargement of their plant and the work will be completed in about three months. A brick and steel constructed addition 85x46 feet and 33 feet high will be built to the molding room. This building will be fitted with a 30-ton traveling crane operated by electric power. It will be used for getting out large castings. The other new building will be a machine shop, 152x52 feet, which will have a 15-ton traveling crane. The machinery to be put in will be the latest and most improved and will be used for facing and drilling flanges and fittings of all kinds. The improvement when completed will enable the company to cast 10 or 15 tons more of iron daily, and to do much work which can not be done in the present plant.

George H. Holland, vice-president and general manager of the Bridge & Beach Mfg. Co., St. Louis, Mo., died recently.

The foundry and machine shop of H. L. Batchelder at West Derby, Vt., has been sold to Wm. Suitor.

The Worcester Steel Foundry has recently been organized with a capital of $100,000 to manufacture a special rail bond, invented by Wm. E. Oakley, who will be manager of the new concern, which has taken over the plant formerly operated by H. T. Merriam at Millbury, Mass. George C. Whitney is president of the company and Wm. H. Cook, treasurer.

The C. A. Treat Mfg. Co., of Hannibal, Mo., will increase its facilities for manufacturing car wheels. A new plant will be erected.

Jay H. Newbury, Goshen, N. Y., manufac-

turer of iron pipe fittings, gray iron castings, etc., is building an addition to his foundry 26x120 feet.

The recently incorporated Sharp Mfg. Co., Albert Lea, Minn., have taken over the plant of J. G. Sharp, which they will enlarge by the erection of a new foundry, 24x50 feet. The company will manufacture wind mills, tanks, boilers, gasoline engines and will do general foundry work.

The Lima Steel Castings Co., Lima, O., whose plant was damaged by fire on February 23, have consolidated with the National Steel Casting Co., of Montpelier, Ind. D. E. Harlan, the manager of the Lima plant, goes to Montpelier as treasurer and general manager of the consolidated plants. The officers of the new company are as follows: G. Max Hoffmann, Ft. Wayne, Ind., president; James O'Donnell, vice-president; F. E. W. Scheimann, secretary, and D. E. Harlan, treasurer and general manager. This consolidation practically doubles the capacity of the Montpelier plant, as all of the molders and other employes of the Lima plant have been transferred to Montpelier. The difficulty in securing structural steel decided the directors of these two companies to consolidate, thus preventing a six months' loss of business. The Lima plant was very successful and had established a desirable reputation among the users of steel castings. The Lima plant had recently purchased an entire new equipment, which has been transferred to Montpelier. For the present the Lima plant will remain closed and all contracts will be filled at the Montpelier plant.

The Railway Steel Casting Co. has been organized by G. W. Eisenbeis, C. C. Smith, and J. W. Anderson, of Pittsburg. The members of the new company are also connected with the Union Steel Casting Co., of Pittsburg, which is engaged in producing a general line of steel castings. The new plant will be devoted entirely to railroad work and is to be built at Tarentum, Pa., about 15 miles from Pittsburg. The main foundry will be 140x340 feet in size and it is intended to have it ready for occupancy by Oct. 1.

The Monongahela Foundry & Forge Co., recently incorporated with $50,000 capital stock, have secured the buildings at Monongahela, Pa., formerly occupied by the Pittsburg Stove & Range Co., for the purpose of making grey iron castings and forgings. The company have equipped part of the building for foundry work and will make a specialty of light machine molded castings. The officers and directors of the company are: C. S. Johnson, president; Alfred Lotz, vice-president; directors, Samuel McElroy, George W. Rhodes and H. G. Wasson.

The Harbor View Foundry Co., lately reorganized at Bridgeport, Conn., are building a new shop which will permit them to increase their working force by about 25 molders.

The Richmond Stove Co., of Norwich, Conn., are enlarging their foundry and erecting a new set of core ovens which will meet the requirements of this department.

Two new foundries will be built in New London, Conn., during the summer. The D. E. Whiton Machine Co., and the Riverside Ship Yards will both have casting establishments of their own.

Hobson & Co., of New York, have leased the plant of the Phillipsburg Stove Co., at Phillipsburg, N. J., and will shortly put the plant in operation, manufacturing machine and stove castings and stoves.

The Deposit Iron Co., Deposit, N. Y., has leased its foundry to the Deposit Foundry Co., the latter a recently incorporated $10,000 organization having George M. Ballard as president and treasurer; Walter S. Vosburgh as secretary and manager.

The Glazier Stove Co., of Chelsea, Mich., are adding a brass foundry, having six furnaces, to their plant.

R. Hoe & Co., of New York City, the well known builders of printing presses, are arranging to erect a modern foundry during the summer.

The Chicago City Railway Co. has purchased a large tract of land at 78th street and Wentworth avenue, Chicago, to which will be removed all of the mechanical departments of the company which comprise machine shop, brass foundry, blacksmith shop and car repairing departments.

Chas. Nickel has added a small foundry to his machine shop at Hebron, Nebr.

The United Engineering & Foundry Co. have bought the chilled roll foundry formerly operated by the Apollo Iron & Steel Co. at Vandergrift, Pa. The output of the plant was rolls exclusively. The acquisition of this plant gives the United Engineering & Foundry Co. five plants, four of which are in the Pittsburg district, these being McGill & Co., Lincoln Foundry Co., Frank-Kneeland Machine Co., and the Apollo Foundry at Vandergrift. The

concern also own the Lloyd-Booth Works at Youngstown, Ohio.

The McMyler Mfg. Co. expect to have their new plant at Warren, Ohio, ready for operations about the middle of June. The foundry building is now under construction.

The Aurora Foundry & Machine Works, Aurora, Mo., manufacturers of complete concentrating and pumping plants, have purchased the foundry and machine works at Iola, Kan., the buildings of which are now in course of erection, consisting of a foundry, 50x60 feet; machine shop, 50x60 feet, two stories; blacksmith shop, sheet iron and boiler department, 50x100 feet. The new plant will be run as a branch of the Aurora works.

L. W. Dailey & Son, of Stillwater, Minn., manufacturers of steel ranges and heating stoves, will add a foundry department to their works.

The Kelly Springfield Road Roller Co., Springfield, Ohio, recently incorporated for the manufacture of road rollers, engines and boilers, have purchased the old rolling mill building, 121x287 feet, and the steel plant, a brick structure 80x360 feet, of the East street shops, for about $35,000, which they will immediately prepare for occupancy. The new company will take over the business of the O. S. Kelly Co. and remove their equipment to the new quarters.

The Girard Foundry & Machine Co., Girard, O., contemplates the erection of an addition to its foundry and machine shop.

The Canton Foundry & Machine Co., of Canton, Ohio, have increased their capital stock from $25,000 to $100,000.

The Wheeling Gas Stove & Range Co. has been formed at Wheeling, W. Va., and a site selected for a foundry and general factory. G. Repetto will be general manager of the concern.

W. H. Linton & Co., of Providence, R. I., will remove their works to Ogdensburg, N. Y., where a site has been secured. This concern makes a specialty of brass trimmings for various purposes.

Frank Martin, owner of the Harrison Foundry, Harrison, Ohio, has sold his plant to the Cincinnati Seating Co., who will enlarge it at an early date.

An addition will be built to the foundry department of the well known scale works of Jones of Binghamton, Binghamton, N. Y.

The Grays Harbor Iron Works, of Hoquiam, Wash., have been reorganized and a large and thoroughly equipped foundry and machine shop will be built soon. The machine shop will be 40x80 feet and two stories high, the foundry 40x50 feet and the blacksmith shop 36x50 feet. The cost of the new plant will be $15,000. The officers elected are as follows: W. G. Cullen, president; E. W. Kan, secretary, and John Allman, treasurer.

The Alliance Machine Co., of Alliance, Ohio, who were incorporated some time ago with $200,000 capital stock to manufacture special machinery and cranes, have organized with W. C. Whitehead, Cleveland, president; W. H. Purcell, secretary and general manager, and H. S. Milburn, treasurer. Mr. Purcell has had long experience in similar lines having been for a number of years general manager of the Morgan Engineering Co., of Alliance. The main shop of the plant, 300x120 feet, is under way, and will be placed in operation in about 60 days. A large foundry will be built later in the year, and probably another erecting shop.

The McConway & Torley Co., of Pittsburg, manufacturers of malleable and steel castings and sole manufacturers of the Janney coupler, have recently added a basic open-hearth steel furnace to their plant, which is now in operation.

The Framingham Industrial Association have let the contract for the erection of a new foundry building, 78x120 feet, at South Framingham, Mass., to be completed in six weeks. The plant will be conducted by William Fenton, Jr., of Worcester, Mass., who will manufacture iron and brass castings.

Harry G. Hart, proprietor of Hart's Iron Foundry, Salem, N. J., has completed arrangements to enlarge his plant and has associated with him J. W. Van Meter, a manufacturer of brass trimmings. The firm have incorporated with a capital stock of $100,000, and will hereafter be known as the Salem Iron & Brass Mfg. Co.

According to local reports the American Blower Co., of Detroit, Mich., intend in the near future to erect a foundry to supply themselves with castings, of which their works consume a large tonnage annually. The Northwestern Foundry & Supply Co., of the same city, are also making preparations to increase the capacity of their foundry.

The interests of the Advance Thresher Co., Battle Creek, Mich., the Minneapolis Threshing Machine Co., with works at Hopkins, Minn., and the John Abell Engine & Machine Works of Toronto, Canada, have been amal-

gamated with a view of increasing the capacity of the latter concern so that it may take care of all Canadian trade which is now split up among the three companies, who are all large manufacturers of threshing machinery.

The International Steam Pump Co. will build one of the best equipped foundries at their Snow works, Buffalo, N. Y. The main structure will be 132x404 feet in size.

The Stirling Steel Casting Co., of Pittsburg, have applied for a charter and will erect a plant at Braddock, Pa., for the manufacture of steel castings. The incorporators are H. E. Wainwright, S. J. Wainwright, Jr., H. E. Wainwright, Jr., Uriah Tinker and H. I. Fisher.

Joseph F. Rothe, now operating a foundry and machine shop at Green Bay, Wis., has decided to erect an entirely new plant which will have a daily output of twice the present plant.

The Montpelier Cup & Metal Works Co., of Montpelier, Ind., is erecting a foundry which will be of sufficient size to accommodate twenty-five molders. A. P. Smith is manager of the concern.

The Wisconsin Foundry & Mfg. Co. have discontinued the operation of their plant at Racine, Wis.

The Zanesville Malleable Iron Works Co., of Zanesville, Ohio, have been incorporated with $50,000 capital stock by R. H. Frees, J. D. Brennan, S. H. England, M. M. Granger and S. M. Granger. Mr. Frees is at present manager of the Walkerville Malleable Iron Co., Walkerville, Ont., while Mr. Brennan was for several years superintendent of the Michigan Malleable Iron Co., Detroit, Mich.

According to Pittsburg reports the Kinzer & Jones Mfg. Co., of that city, will dismantle their foundry and retire from business.

The St. Louis Brass Mfg. Co. is incorporated with a capital stock of $50,000 to do business in St. Louis, Mo.

The H. Adler Co., of Pittsburg, Pa., manufacturers of gasoline stoves and ranges, have purchased a site at Carnegie, a suburb, where it is the intention of the company to erect several buildings, which will cost, with their equipment, at least $75,000. There will be a one-story foundry 70x150 feet, a mounting room 40x200 feet, a finishing room 30x120 feet, a store and stock room 50x200 feet, an enameling room 50x100 feet, and an engine house. The other buildings will be one-story structures and will be ironclad. A gas engine of 100 horsepower is to furnish power. The work of building is now going on and the company expects to have everything ready for operation by December 1.

The Furlow Sanitary Brass Works Co. has been incorporated at Philadelphia with a capital of $50,000.

Charles Fairchilds and Lewis Betts have purchased the foundry and machine shop at Warren, Pa., heretofore owned by J. Hill & Son.

The Coulter & McKenzie Co., of Bridgeport, Conn., are building a new foundry, as are also the Eaton, Cole & Burnham Co., of the same city.

The Acorn Brass Works of Chicago have increased their capital to $100,000.

The Susquehanna Casting Co., Wrightsville, Pa., manufacturers of builders' hardware and iron castings, are building an addition to their foundry and making other improvements that will double the present capacity.

The Belleville Foundry Co., of Belleville, Ill., has been incorporated with $15,000 capital. W. H. Wangelin, I. H. Wangelin and R. W. Ropiequet are the incorporators.

The Gunther Foundry, Machine & Supply Co., of San Antonio, Tex., has been incorporated with $50,000 capital. Harry Gunther, G. R. Robbins and R. W. Lewis are the incorporators.

At Minneapolis, Minn., a consolidation of the Twin City Iron Works, the Minneapolis Malleable Iron Co. and the Barnett & Record Co. has been effected under the name of the Minnesota Steel & Machinery Co. The company has been capitalized at $500,000 of which $250,000 has been paid in. The old plant of the Minneapolis Harvester Co. at South Minneapolis has been purchased and the three plants will be consolidated in this one large plant. The new company will manufacture stationary engines, machinery, and will do a general foundry business. J. L. Record will be made president and general manager and O. P. Briggs will be placed in charge of the engine and machinery departments.

The Berwick Malleable Co. are building a plant at Berwick, Pa., which when completed will have a capacity of 40 tons of finished castings per day, making a yearly output of about 12,000 tons. S. F. Forbes is general manager of the new company.

Marshall & Bros., of Fall River, Mass., have installed a brass foundry which will accommodate several molders and turn out all the brass castings required in the company's works. Thomas Creighton will have charge of this department.

The Novelty Mfg. Co., of Rock Island, Ill., will shortly remove their plant to Council Bluffs, Iowa.

The Sprague Foundry & Mfg. Co., of Council Bluffs, Iowa, will erect a new foundry which will be ready for occupancy about October 1.

The Pittsburg Valve & Fittings Co., is reported to have purchased a site at Barberton, Ohio, upon which will be erected a large manufacturing plant.

The International Heater Co., Utica, N. Y., will erect a building of brick construction, 110x150 feet, to be used for foundry purposes. This will increase the molding capacity of the plant 75 per cent.

The Coshocton Tool Co. has been organized at Coshocton, Ohio, and will build a foundry, machine and pattern shop which are to be ready for occupancy in about sixty days.

Frank I. Clark, a well known machinist of Augusta, Me., is organizing a company to operate a foundry in that city.

F. O. Phillips has purchased the foundry at Medina, Ohio, which he is now overhauling and equipping with the intention of manufacturing hollow-ware.

The Danville Foundry & Machine Co., Danville, Ill., are figuring on extensions for their plant which will nearly double its capacity.

Charles F. Dunbar, of Buffalo, N. Y., is reported as intending to erect a large foundry in that city. Negotiations are now under way for a suitable site.

The Chase Pump & Mfg. Co., of Columbus, Ohio, have changed their firm name to the Chase Foundry & Mfg. Co.

Both the foundry and machine shop of the Whiting Foundry Equipment Co., at Harvey, Ill., are being extended to accommodate the increasing trade of this concern.

The Creswell & Waters Co., of Philadelphia, will put up a foundry building during the summer to be 288x118 feet in size. The estimated cost is $40,000.

The Marinette Iron Works Mfg. Co., Marinette, Wis., have decided to remove their plant to Warren, Pa., where six acres of land in a choice location have been purchased. The main buildings to be erected are a machine shop, 80x350; foundry, 80x250, and blacksmith shop and pattern shop, etc. The buildings are to be of brick and steel construction, the different departments being equipped electrically, power to be supplied by the company's own gas engines, direct connected to generators. The plant will be equipped with modern appliances adapted to the class of work done by the company, which will give them three times the capacity of their present shops.

Deaths.

Patrick F. Carroll, manager of the Litchfield Foundry & Machine Co., Litchfield, Ill., died April 22, aged 36. He will be succeeded by Edward Sweeney who has for some time been connected with the works in a minor capacity.

M. S. Groff, who for several years operated a foundry at Ephrata, Pa., died recently, aged 65.

John G. Fritsch, president and treasurer of the Francis Fritsch Mfg. Co., Cincinnati, Ohio, died April 27, aged 42.

William S. McNaughton, who for several years has been connected with Matthew Addy & Co., representing them in Northern Ohio, died recently in Detroit, Mich.

George W. Grimes, of Bluffton, Ind., died April 29, aged 46. He established the plant which bears his name in 1879.

Fires.

The plant of the Medart Patent Pulley Co., St. Louis, Mo., was completely wrecked by a fire May 4. The loss is estimated at $250,000.

Fire at A. D. Allen's foundry, Nevada City, Cal., May 2, did considerable damage to patterns and machinery.

A portion of the Iron City Mfg. Co.'s plant at Pueblo, Col., was burned April 28, entailing a loss of $100,000. The foundry and machine shop are not materially damaged.

Bartlett, Hayward & Co.'s foundry at Baltimore, Md., sustained damages amounting to about $7,000 through a fire April 24.

The plant of the Champion Iron Co., Kenton, Ohio, was destroyed by fire April 23. The loss is estimated at $225,000.

The Crowell Crutch & Pulley Co.'s foundry, Westfield, N. Y., was destroyed by fire April 26. Loss is estimated at $20,000.

J. T. Carmody's foundry in Cedar Rapids, Iowa, was destroyed by fire April 23, entailing a loss of about $25,000.

Charles Brunner's foundry, Peru, Ill., was burned to the ground recently. The loss is $15,000.

The foundry of the Fairbanks Construction

Co., Marion, Ohio, was damaged to some extent by a recent blaze.

The shops of King, Walker & Co., Madison, Wis., were damaged by fire April 30.

The plants of the Columbus Iron Works Co., and the Southern Plow Works, allied concerns, Columbus, Ga., were destroyed some time ago causing a heavy loss.

The mounting and pattern departments of the Globe Steel Range Co., Kokomo, Ind., burned recently, resulting in a loss of $15,000.

The plant of the Hildreth Motor & Pump Co., Lansing, Mich., was visited by fire April 22. The loss on patterns and stock is estimated at $25,000.

R. B. Patterson's foundry, Ludington, Mich., was considerably damaged by a recent fire.

The Iowa Iron Works, of Dubuque, Iowa, was damaged to the extent of $25,000 May 8. The loss is amply covered by insurance.

A Thirst Quencher for Hot Days in Foundries.

In nearly every foundry more or less inconvenience, if not actual suffering, is experienced by a certain percentage of the workmen during warm weather, and especially is such the case at casting time. In many shops the employes band themselves together in a temporary club for the purpose of purchasing a daily supply of ice to cool the drinking water consumed, in others the management have thought it advisable to arrange for this, believing perhaps that it is a paying proposition to have their workmen as comfortable as possible, in which they are undoubtedly right, as labor that is well taken care of will show a larger output. As it is granted that it pays to ventilate and keep a foundry cool during the heated season it ought not to take much argument to show that there ought to be a profit in satisfying the general craving for a cooling and clean drink during the same period. In this connection it is interesting to note the method followed in the various departments of the large works of B. F. Avery & Sons, Louisville, Ky., manufacturers of agricultural implements, in describing which they say:

"We take stone jars or kegs holding about ten gallons of water, filled with water and a small quantity of ice, pack the jar in a barrel with sawdust between the inner and outer vessels. Thus the water is kept cool with a minimum amount of ice. Each morning we place about one-half pint of oatmeal, rolled oats or any other form of crushed oats in the water. This crushed oats thus used makes the water a remarkable thirst quencher. During the several years that we have thus provided drinking water we cannot recall a case of heat prostration or illness due to excessive drinking of water by men employed in our shops, where the heat is great. We also find that this water reduces the appetite for intoxicating drinks, and in general the effects are so excellent that our men are telling it to workmen in other shops and cities. The jar should be emptied and thoroughly cleansed every morning, as the oatmeal sours over night, and, of course, the drinking cup also ought to be scalded and scoured for obvious reasons each day. We would be glad if the water could be drawn from a spigot, as, of course, from a sanitary view, the use of a dipper in the top of the jar is not as it should be, but the oatmeal clogs the spigot or strainer leading to a spigot. It has contributed not only to the comfort of the men, but has permitted them to continue at work when the heat might otherwise have prevented, and has greatly reduced the temptation of the men to seek intoxicating cooling drinks. For a few days the oatmeal flavor may not be relished by all of the men, but very soon they find it palatable, and are delighted by the relief afforded."

Indications of Fracture in Pig Iron.

The indication of fracture in foundry irons has always played an important part in foundry practice, and must continue to do so even when the mixing and melting of iron is entrusted to a chemist; for there are many things indicated by the appearance of the fresh fracture that are not indicated by analysis, and are beyond the reach of chemistry, and a few points on fracture indications will no doubt be of interest to the student of foundry chemistry. Without a practical knowledge of fracture indications, a chemist can never become a practical chemist of foundry irons. And, with such a knowledge, his laboratory work may be greatly reduced.

Without a knowledge of fracture indications in the pig, a chemist would be unable to determine whether the iron placed upon the scaffold for melting was the grade of iron analyzed or not; and if placed in charge of a cupola might melt an entirely different grade of iron without knowing it. A white or mottled iron might be palmed off on him as a soft iron by cupola men ignorant of the indications of fracture, or by men having a prejudice

against a foundry chemist; a hard iron might be mixed with soft iron by accident, and resultant mixtures indicated by analysis entirely changed at the cupola spout.

To avoid such chances of bad results, the chemist, when making determinations, should not only have borings from various parts of the pig, but he should also have a sample of the pig, at the point from which they were taken, and make a study of the fresh fracture in connection with his analysis. Such a study should be made with the naked eye and also under a glass, and all the peculiarities imparted to iron by the various metalloids should be ferreted out and fully understood, so that the chemist may be able to pick out by fracture, in the yard or upon the scaffold, any grade of iron he has analyzed.

The fracture of a freshly broken pig indicates to the fracture expert the characteristics of an iron almost as accurately as does an analysis. The chemist, by a study of fracture in connection with analysis, should become more accurate in fracture indications, than the expert who is not a chemist, and he should be able to say from the fracture about the per cent of combined carbon, graphite, silicon, sulphur, phosphorus, etc., an iron contains, and indicate whether it will run hard, soft, strong, weak, open, dense, etc., when melted and cast.

In making such a study, analysis should be made from near the sow end, tail end and center of the pig, and a system of averages established both of fracture and analysis. By such a system the average per cent of the various metalloids contained in an iron may be determined by one analysis from near the center of the pig, and the number of determinations and amount of laboratory work reduced to a minimum. And more time given to the chemist to look after the cupola and the mixing and melting of iron.

In cast iron, the characteristics of the iron are indicated by the size, shape and color of the crystals, and are more plainly seen in the fresh fracture than in an old fracture, the color of which has been changed to a greater or less extent, by action of the atmosphere upon the iron.

A very hard iron in the pig has a very small whitish crystal, which, giving to the fresh fracture a whitish appearance, designates it as a white iron. This iron runs very hard in light as well as heavy work. In a mottled iron we find a larger crystal of a bluish cast, with white thread-like streaks winding around among the crystals, which designates it a mottled iron. This iron generally runs strong and close in heavy work, but very hard in light work.

A number two iron has a small crystal similar to that of a mottled iron, but without the thread-like streaks within the crystals. This iron runs soft and very close in heavy work, gives a fine finished surface in planed, turned or bored work, but generally runs hard in light castings.

The fracture in number one iron presents a large crystal of a dark bluish cast, and generally runs soft in light or heavy work, but in the latter is very open and porous, and does not give a bright surface when finished. And for finished work has to be mixed with scrap or pig having a smaller crystal.

In silver gray iron we find a very small crystal similar to that of a white iron, and it is only distinguished from the white iron by the silvery gray color from which it receives its name. This iron runs very soft in either light or heavy work, but is so rotten in the pig and when cast that it cannot be used alone for either light or heavy work.

A high silicon iron may have a large or small crystal, but always has a silvery gray cast of color, and like silver gray iron, is too rotten to be used alone.

The charcoal irons have a different shaped crystal from the anthracite or coke irons. It is smaller than that of the No. 1 iron, more pointed and sharper to the touch than those of any of the grades of these irons. The sharp pointed drawn out crystal indicates strength in the iron.

These are the general characteristics of fracture in foundry irons, by which the founder has been guided for many years in selecting iron for work to be cast or in making mixtures for work, when a suitable iron is not obtainable. The indications of fracture are changed to an almost imperceptible degree by variation in the per cent of various metalloids contained in the iron, and for this reason the founder is not always successful in making an iron suitable for the work to be cast.

The chemist, by careful study of fracture in connection with analysis, should be able to overcome this difficulty and indicate from fracture the exact characteristics of an iron in the pig and when cast.

Not only are fracture indications of value to the founder and chemist before iron is melted, but also after it is cast. Without a knowledge of fracture indications the founder would have to file or drill every piece of iron

to learn if it was hard or soft, and the chemist by his science, would have to analyze it. This laborious work may be dispensed with to a large extent by an accurate knowledge of fracture indications, by which the quality of an iron in the casting may be instantly judged from the appearance of iron in the gate or fracture in condemned castings.

In light thin castings the iron when hard is always white or of a very light color; when soft it presents a small crystal and has a grayish blue cast. In heavy work it is white or mottled when very hard, and when not so very hard has a very small crystal with a light grayish cast.

When soft it presents a large crystal with a bluish cast. When the crystals are very large, they indicate an open porous iron that does not polish or finish well. An uneven crystalline structure throughout the fracture indicates an uneven or spotted iron with hard spots that are difficult to machine.

In the crystalline structure of a casting, the crystals are always larger and the iron more open and porous near the central portion than near the outside, where the iron has been more rapidly cooled.

Light castings are generally harder at some distance from the gate than near it, and the crystals are smaller and lighter in color.

In cracks or breaks from shrinkage and strain, the fracture indicates whether the crack or break occurred when the casting was hot or cold, and also whether the iron was fully set or in a semi-molten state. The fracture of iron broken when hot has not the luster as when broken cold, and is of a dark blue or iron rust red color, depending upon the degree of heat in the casting at the time of breaking, and manner of cooling after breaking.

The most important evidence of breaking when hot is the lack of luster in the fracture, which may readily be seen by breaking the casting again, and comparing the fresh fracture with the one made when hot.

Iron broken when in a semi-fluid state presents a dull round pointed crystal or no crystalline structure at all, depending upon the condition of the iron when broken. The color varies from a red to a very dark blue. The indications of this fracture are important, as they show if an iron has excessive shrinkage, and parts of the castings, when the iron is in a semi-fluid state, draw away from other parts that are prevented from following by the mold; as frequently occurs in pipe founding where the body of a pipe cast on end draws away from the bowl as the iron sets, when iron has excessive shrinkage. Were it not for the indications of fracture in such cases, the founder would frequently be unable to determine whether the break was due to excessive shrinkage or careless handling of the castings when removing it from the mold. It is also of importance in determining if castings are broken in being shaken out too soon after casting, by molders in a hurry to get through with their day's work and get out of the foundry.

Fracture shows up a dirty iron, and in many cases indicates where the dirt came from; whether due to a dirty mold, careless skimming, bad pouring, or improper gating. These and many more important points in foundry practice are indicated by fracture, and they should all be fully understood by the practical founder and chemist, who desires to be a master of the foundry business.—[Edward Kirk in *American Manufacturer*.

Another Process.

There is a party by the name of Marcus S. Sly, of Medina, N. Y., who has obtained patent 695,177 on a process of treating iron scrap. He prepares a compound from oxide of aluminum and oxide of iron, using each in equal proportions. According to his description he lays a plate of old sheet or scrap iron upon the coke in the cupola, and upon this places a layer of the above mentioned compound. On this he charges some more fuel and repeats his performance with the sheet iron and the compound. He says that a scrap metal is converted into a product of high value and makes other claims which are not clear, and probably will not be until after some experiments have been made.

Doing a Big Business.

The Foundry sold 116 plow points and land sides last Saturday.—[Shepherd (Mich.) *Republican*.

The Bradford Gas Engine Co., Bradford, Pa., and the Flickinger Iron Works, of Cochranton, Pa., have been consolidated and will hereafter be known as the Flickinger Iron Works. The plant at Cochranton will be abandoned and in the future all of the work of the company will be done in Bradford. The buildings will be enlarged and the present output doubled.

A Special Flask.

When visiting a large foundry some years ago, I noticed particularly a certain casting which was then being molded in the floor. This casting was of box form, and the section of metal was very thin; the aim being to produce as light a casting as possible. The sizes were 2 feet 4 inches long by 1 foot 4 inches wide, and 1 foot 4 inches deep. Numerous facings and slot cores were distributed over the sides and ends of the pattern, so that both sides and ends had to be removed before drawing the pattern off the core, and also to facilitate the placing of numerous cores and to finish the mold.

The method employed at that time was to slide the side and end cheeks back from the pattern by means of bars upon which the cheek plates rested. This, however, was found to be a very uncertain way of working, and numerous wasters were the result, quite 50 per cent being bad, either through the castings being misrun, through the sides of the mold being rammed into the thickness, or through the straining of the sides, causing much too heavy a casting. A first-class floor molder was two full days in getting one mold ready for pouring.

A few weeks ago I had occasion to visit this shop again, so I looked around for that box pattern, and I also inquired how they were working it. I found that a special flask had been designed for molding this pattern, with hinged sides and ends. Fig. 1 is a sketch, from memory, of the flask, with the top part lifted off and all four sides cottered up. Fig. 2 shows a side and end let down, and the corner pillars in position for securing the hinged sides and ends in their exact positions.

In molding, the pattern is set on four corner stands or stools, fastened in the flask, as in the section, Fig. 3. The inside or core is first rammed up. Inside the core a perforated cast-iron box is fixed, leaving three inches of sand around the sides of the core, and also on the top, as in the section. The top plate of the

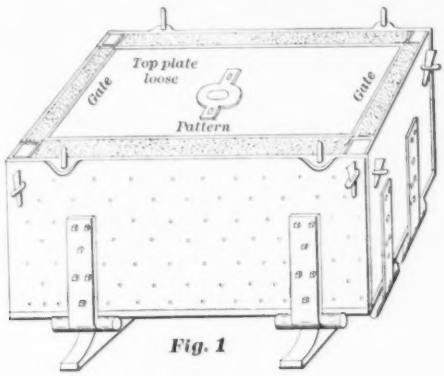


Fig. 1

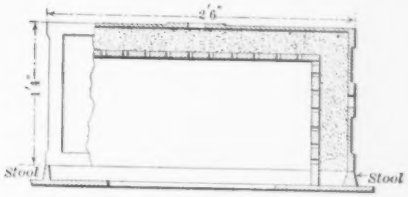


Fig. 3

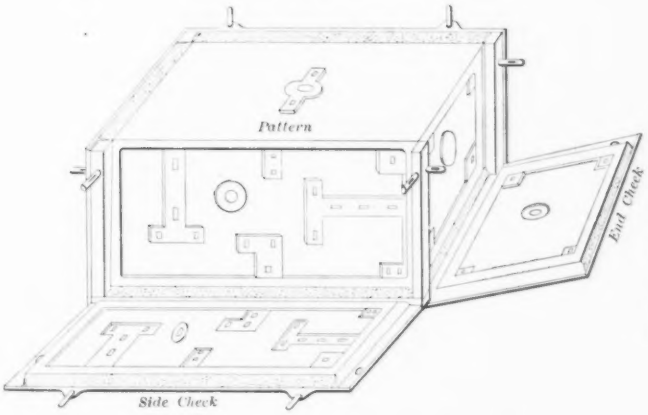


Fig. 2

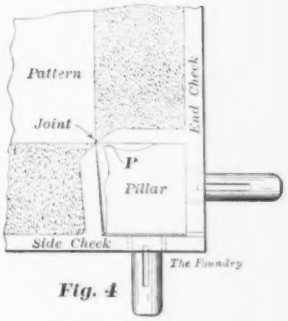


Fig. 4

A SPECIAL FLASK.

pattern is loose, and is put back in its place when the core is filled. When tucking the core the outside cheeks are cottered up tight. They are now let down and the joint is formed around the bottom edge of the pattern. The cheeks are now cottered tight again, and all four cheeks are rammed up together, no side joints being formed; the flask being so arranged as to form the four corner joints very well.

Fig. 4 is a plan of a corner of the flask enlarged, showing how the joint is formed. The knife edges on each cheek meet each other and come to within one-eighth inch of meeting the corners of the pattern. After the pattern is drawn and the mold is finished, the sides are shut back to their exact position, and the space behind the joint *P*, Fig. 4, is filled with dry parting sand. The castings made in this flask are uniform in weight, the number of wasters is almost *nil*, and the time occupied in molding a single box is four hours.—[GEORGE BUCHANAN, in *American Machinist*.

Breaking up Cast Iron Guns.

The Government recently sold a large number of old cannon, among the largest of which were some 15-inch smooth-bore Dahlgrens cast in the early '60's. The purchasers were confronted with the problem of converting these heavy pieces of cast iron into marketable shape as scrap iron, wherein no single piece should exceed 200 pounds in weight. After doing considerable experimenting they adopted the method of drilling rows of holes longitudinally, afterwards driving steel wedges into these holes until the gun split open. To permit of the drilling being done as rapidly as possible the guns were jacked up on roller bearings so that they could easily be revolved, when a frame carrying 15 drills was set over the gun and 1-inch holes drilled to a depth of about 7 inches. In this way the guns were split into suitable sections when they could easily be broken into smaller pieces.

Each gun weighed 42,000 pounds and had a thickness of metal varying from 17 inches at the breach to 3 inches at the muzzle. Many of these guns had never been fired and these were found much more difficult to break up than those which had been in use.

Notes from Various Sources.

J. B. Orbison has been appointed general manager of the Southern Foundry & Machine Works, Fredericksburg, Va.

The Osborn Mfg. Co., of Cleveland, Ohio, have issued a new and complete catalogue which describes the many forms of special foundry supplies made by them. These include practically all of the smaller tools used by casting cleaners and molders.

The H. R. Worthington Pump Works, of Elizabethport, N. J., have granted all of their employes a nine hour working day without any reduction in pay.

The Philadelphia Pneumatic Tool Co., expect to have their new shops at 21st St. and Allegheny Ave., Philadelphia, ready for occupancy June 1, when their working force will be increased at least fifty per cent.

Jacob Ott has accepted the position of foundry foreman with the Janney Mfg. Co., Ottumwa, Iowa.

The S. Obermayer Co., Cincinnati and Chicago, are mailing to the trade a neat little booklet dealing with foundry facings and blackings and the proper method of using these.

Pawling & Harnischfeger, of Milwaukee, have issued bulletins describing their Traveling Electric Hoists, Chain Block Traveling Cranes and Standard I-Beam Trolleys.

E. H. Israel has taken charge of the brass foundry of the Edwardsville Brass Co., Edwardsville, Ill., succeeding C. H. Harkins who it is reported will establish a plant of his own in St. Louis, Mo.

The R. MacKellar's Sons Co. have been incorporated at Peekskill, N. Y., to manufacture foundry facings and supplies, by Archibald MacKellar and W. H. MacKellar, of Peekskill, and Robert MacKellar, of Red Bank, N. J.

Pettinos Brothers, of Bethlehem, Pa., whose facing plant was burned some time ago, have their new quarters nearly completed.

Pierce G. Smith is now making sundry little journeys in the interest of the J. D. Smith Foundry Supply Co., of Cleveland, and in other ways preparing himself for initiation into the Plumbago Club.

The American Soil Pipe & Foundry Co., of Bessemer, Ala., has been incorporated with $100,000 capital to operate a foundry for the casting of soil pipe, hydrants, etc. W. J. Long, T. Y. Huffman and H. C. Mead are the incorporators.

Plans are being considered by the Austin-Bryan Mfg. Co. of Ensley, Ala., for the building of a foundry at an early date.